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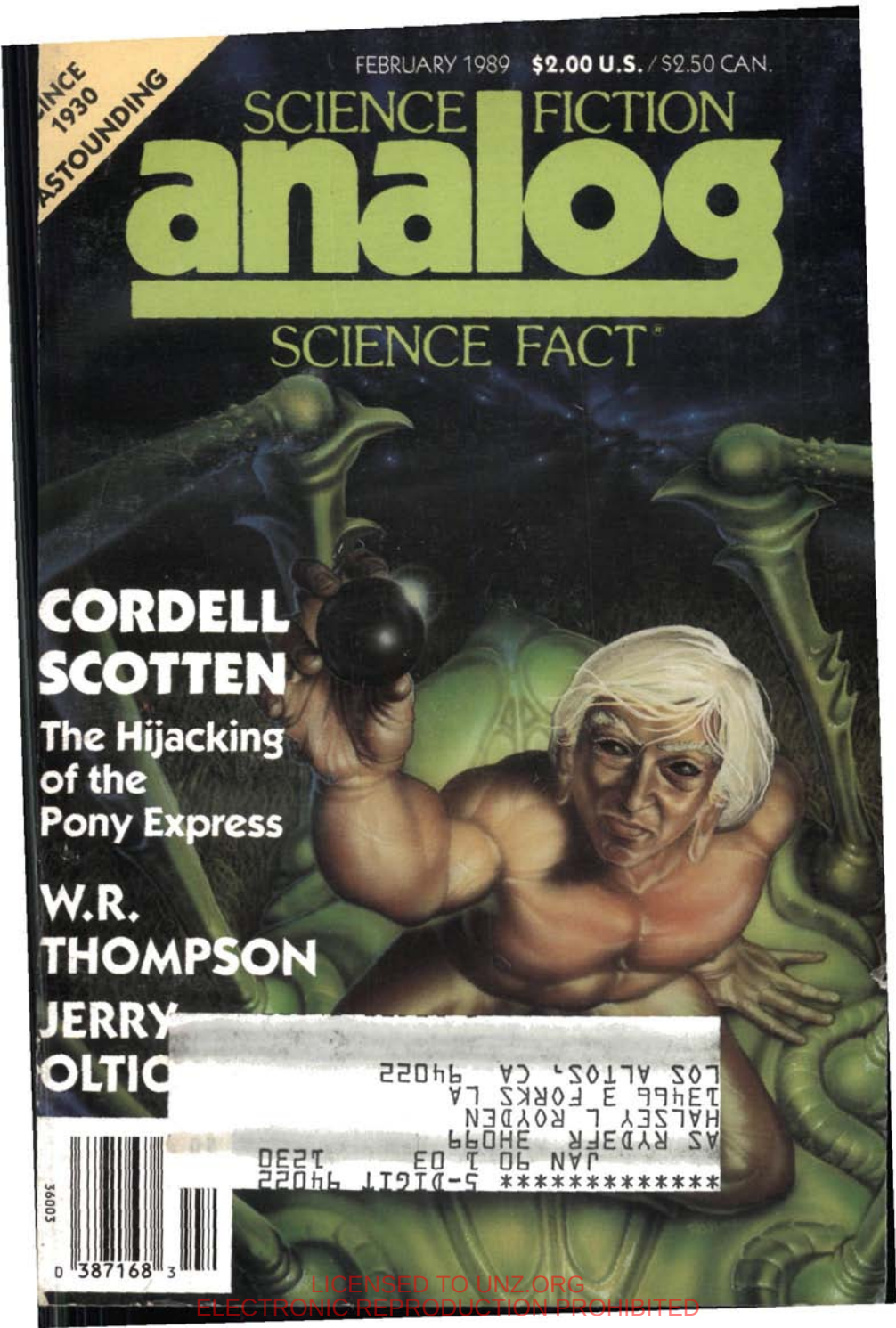

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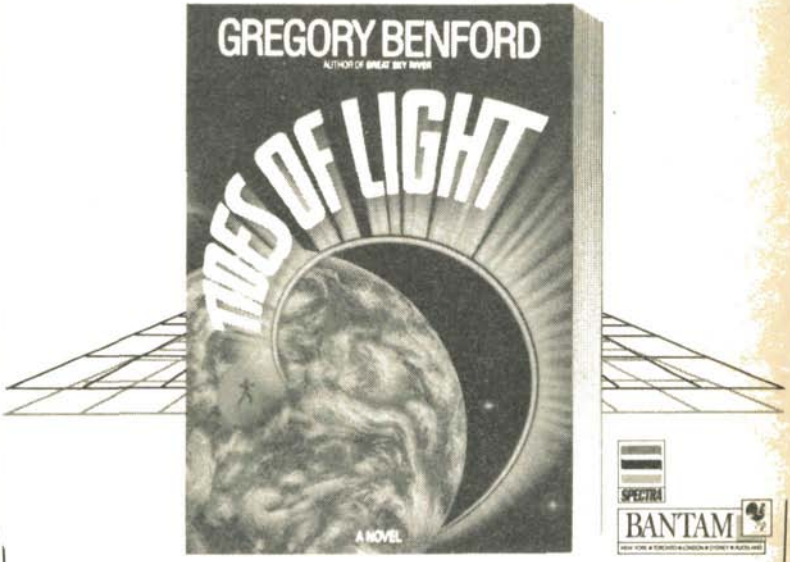

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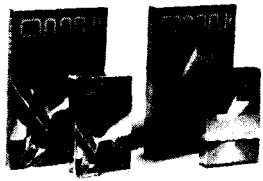

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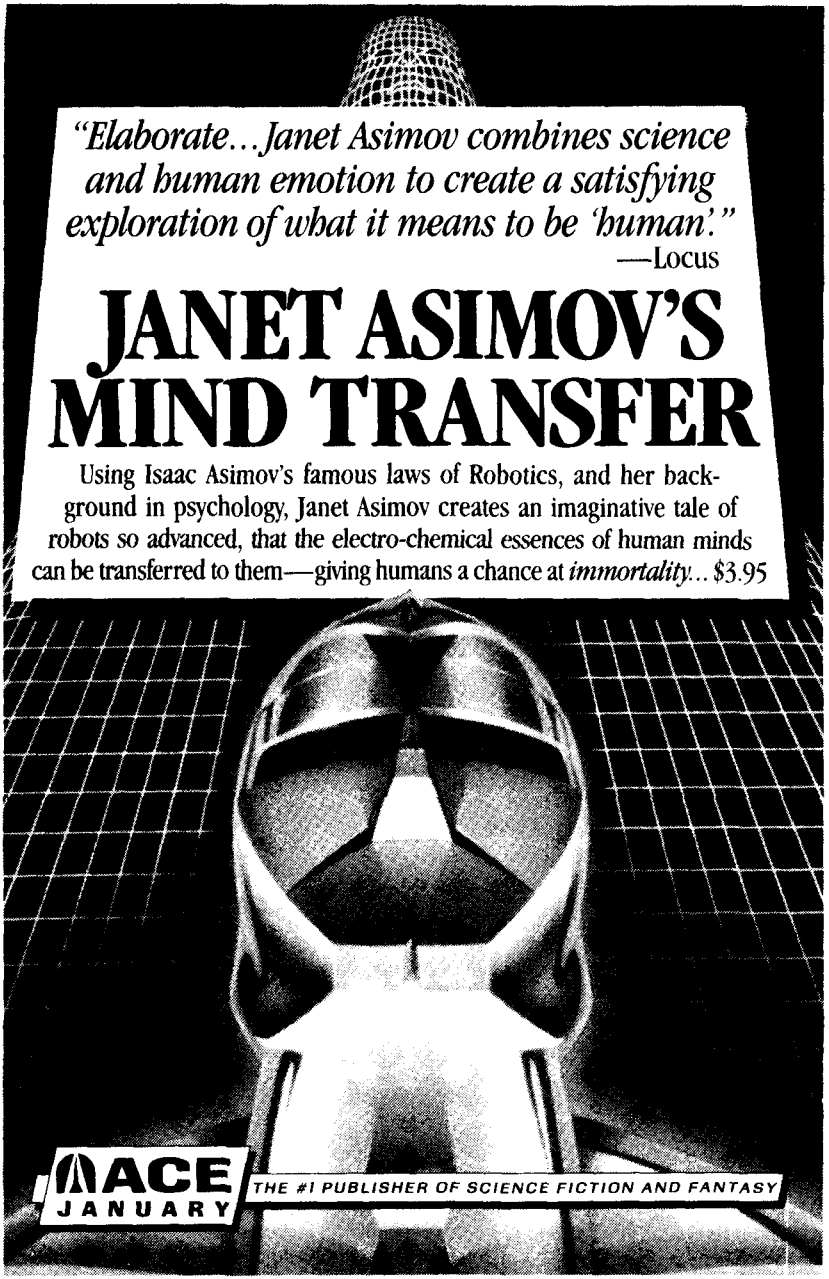
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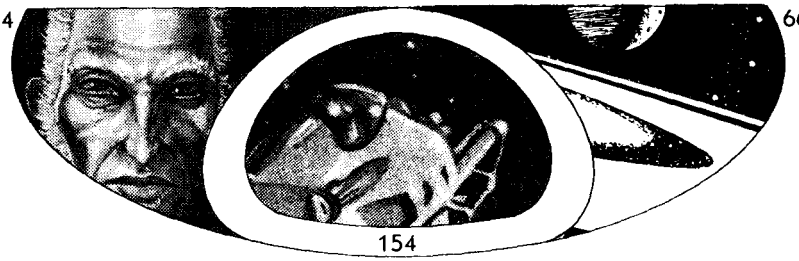

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Editorial

INTERNAL AFFAIRS

Stanley Schmidt

If you've been paying the slightest attention to newspapers and similar media in this country in recent years, you've probably noticed a great deal of public and private activity with the openly avowed goal of bringing about large changes in the internal conduct of other countries. A good deal of official foreign policy is devoted to such activities as supporting the regime of Our Administration's choice in this or that Central American country (or overthrowing one that Our Administration doesn't approve of). Both government actions and private protests by groups of concerned citizens seek to exert pressure toward the abolition of *apartheid* in South Africa or the improvement of human rights in the Soviet Union.

In at least some of these cases, most Americans, at least, would find it hard to dispute the worthiness of the goals. But the *methods* raise a most interesting complex of questions (and I'll confess right at the start that I have more questions than answers). When, if ever, are matters directly involving only the government and citizens of one country a legitimate concern of the government and citizens of another country? If such legitimacy does exist, what kinds of action can country B legitimately take in regard to the internal affairs of country A? What long-term significance might the trend toward growing acceptance of such "internal" meddling have?

If, indeed, it really is a trend. Trying to decide what's best for people somewhere else, or even trying to do something about it, is hardly a radically new

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idea. Foreign policy has long included efforts to see that other countries' governments would be easy to work with. History is full of crusaders and missionaries setting forth to bring Spiritual Enlightenment to the Heathens, whether the Heathens wanted it or not, and empires bravely shouldering the "White Man's Burden" (or its local equivalent) to bring Civilization to those not blessed with it. But advances in technology have made it easier than ever before to get *to* potential enlightenees, and I have the impression that there really are more people now openly and actively seeking to determine how others' countries should be run. Ironically, many of these same people would shake their heads at the miseries unwittingly brought to "primitive" tribes by well-meaning missionaries of the past—but, of course, what *they* want to do is a different matter.

I suppose this is time for the obligatory disclaimer to try to forestall the misreading that I know will happen anyway. No, I am *not* condoning *apartheid* or persecution of Jews. I am merely questioning—and please be sure you understand the difference between a question and an answer—whether and when it is appropriate for *us* to try to solve these problems for *them*.To some it might be obvious that if nobody else is solving the problem, we owe it to the victims to do it ourselves, as a humanitarian gesture. But how would these same people feel about a group in Pakistan or Uganda taking it upon themselves to solve some of *our* problems? Suppose, for an example chosen to avoid fingering any real group, that there is an organization somewhere convinced that the U.S. is a threat to world peace because its society has been corrupted by the idea (contrary to this group's fundamental religious tenets) that women should have equality with men. Would we welcome their attempts to undo the "damage" to our social fabric? I hope not—but if not, where is the fundamental difference between their wish to shape our society, and our wish to shape theirs?

Obviously, you may say, the important difference is that we are *right* and they are wrong. Ah, but that's exactly what they think over there, too. Can you suggest an objective test that we can both agree on, to determine which of us is *really* right?

The point of all this is that the ethics of such meddling (or helping, depending on whom you talk to) are far from simple. Even interactions between two individuals are often full of ethical subtleties and thorns. In the kind of case I'm talking about, things are vastly more complicated. A question like "What should Americans do about *apartheid*?" involves at least three different kinds of ethical relationships, none of them simple:

(1) Individuals interacting with individuals.
(2) Individuals interacting with governments.
(3) Governments interacting with governments.

I have previously proposed, as a basic ethical principle, that interference with person *A* can be justified if and only if

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his actions will otherwise have an adverse effect on person *B*. For example, a passer-by might be justified in forcibly removing an eighth-grade bully from a first-grader being beaten up on the way to school. That's a "Type 1" interaction. It is tempting to assume that the ethics of interactions between nations ("Type 3") are analogous, and that country *C* can justify military or other action against country *D* only to protect itself or another country from aggression by *D*.

The difficulty is that that simple analogy ignores "Type 2" interactions, which are often of the greatest importance to the people involved. Key fact: Nations are not equivalent to persons. They are *composed* of persons—and the government often equated with "the country" is seldom, if ever, equivalent to the *people* of the country. If the peo-

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ple of a country, or some of them, are being bullied by their own government, might intervention be as much justified, perhaps even morally demanded, as in the case of the bully in the schoolyard?

Maybe so—but one of the most easily justified functions of any government is to protect the country (which would ideally mean "the people") from interference from without. We certainly expect ours to do that. When and how can we justify trying to circumvent that role of somebody else's government?

"When that government is wrong," you may say. "When the interests it's trying to protect are not those of the people it supposedly represents." And I may be tempted to agree—yet still I must be concerned with how we can *know* when that is the case. I can hear some of you saying impatiently that it is so obviously the case in the matter of South African blacks or Russian Jews that the matter should not be dignified by discussion. Again, I am tempted to agree, on the basis of what I have read and heard—but how many of us have *any first-hand knowledge at all* of what's going on in those places? I can easily imagine that, even if the problem in each case is just the kind and just as bad as we think it is, there may be features of that culture that we don't know about that would cause our solution, imposed from without, to do more harm than good.

Remember that elements of social systems may make sense only in the context of the other elements intended to work with them, somewhat as a socket wrench makes sense only in a world that uses lug nuts. "Honesty is the best policy" only in a society in which most people believe it strongly enough to act on it themselves *and* refrain from taking unscrupulous advantage of other people's openness and candor. A society can function reasonably well with either puritanical or traditional Polynesian attitudes toward sex, but it cannot expect its people to subscribe to both without developing all manner of neuroses. A custom may look utterly bizarre to an outsider who sees it in isolation and judges it in the light of *his* cultural context, yet serve a harmless, useful, or even essential purpose in its *own* culture, as part of a self-consistent, interrelated system. Classic example: Katherine MacLean's novelette "Unhuman Sacrifice" (published here in November 1958), in which a well-meaning missionary does considerable damage by interfering with an "obvious atrocity"—which he fails to realize is an integral and essential part of the biological make-up of the species in question.

So—an outsider is not always in a good position to evaluate someone else's "internal affairs." Yet it remains true that governments can do immoral things to their own people. Does the latter fact imply that foreign intervention in internal affairs is sometimes justified, while the former implies that it must be done, when it's done at all, with the greatest caution?

Possibly. My fear for the moment is that intervention (at least by us) is being more widely accepted than the need for caution. Nonetheless, I am intrigued by

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the possibility that this apparently growing acceptance of interference with other countries' internal affairs may represent an early step toward the acceptance of some sort of world government.

The concept of a single worldwide government has, of course, been around for a long time. The League of Nations, and later the United Nations, may be viewed as efforts in that direction, though neither could be considered a true world government. But I don't think the idea has—at least so far—had much popular support. Nations are too different, their peoples know too little of each other, and they quite reasonably distrust the idea of putting their affairs into the hands of unseen strangers who know nothing of conditions *here*.

That just may, for better or worse, be beginning to change. At least a few people in many parts of the world have begun to recognize that some matters *cannot* reasonably be regarded as purely internal, and that for such matters, if no others, decisions need to be made at a higher level than national. My personal preference concerning world government, as for any government at any level, is, "No more than necessary!" But sometimes, like it or not, some may be necessary. People in the western United States have long been familiar with the idea of water rights—that a person living on one part of the river cannot use its water without regard for people upstream and downstream. People in the U.S. and Canada are now finding themselves forced to think together about the problem of acid rain. People all over the world are beginning to recognize that the rampant destruction of tropical rain forests is of direct concern to everyone who breathes, everywhere on the planet.

And now we have what looks like an increasingly casual acceptance of the "rightness" of people in one country taking an active role in determining policies and courses of action within another. Could this be an early phase of acceptance of the idea of a single government shaping policies everywhere? Maybe—or maybe not. One reason for doubt is that while I hear many Americans talking about how South Africa, or the USSR, or Nicaragua should clean up their acts, I hear far less indication of any recognition that South Africans, or Russians, or Nicaraguans might have their own ideas about what *we* should do, much less that we should pay any attention to them. And I have even less firsthand knowledge of what, if anything, people in other countries are thinking about these matters.

So the popularity of trying to dictate other countries' behavior in "internal" affairs *may* be a groping toward some form of responsible unified government, or it may be mere meddling—or the sincerely well-meant efforts to help that sometimes succeed but just as often lead to tragic misunderstandings. In any case, whether those who want to tell other countries how to run their internal affairs have no ambition beyond that, or whether they are thinking in terms of eventual world government, they would do well to bear in mind that turnabout may well be seen as fair play. This point seems to me seldom appre-

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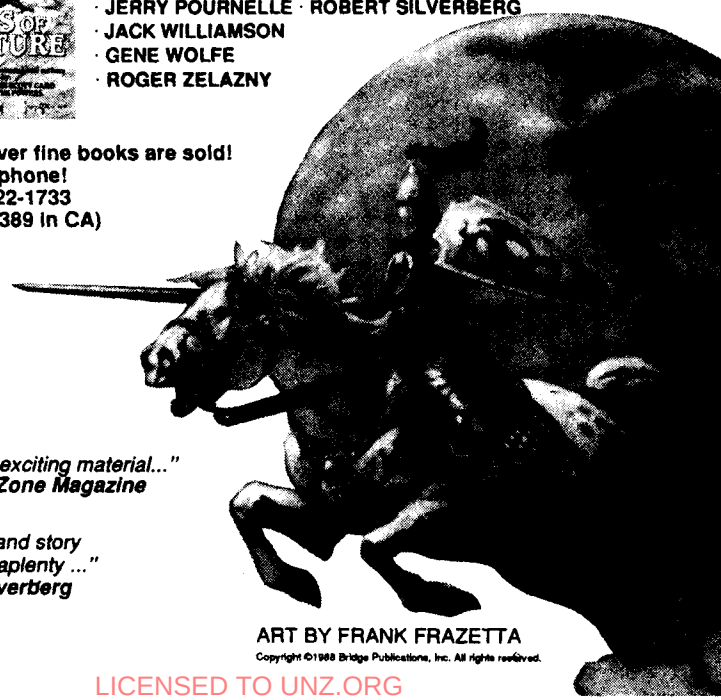

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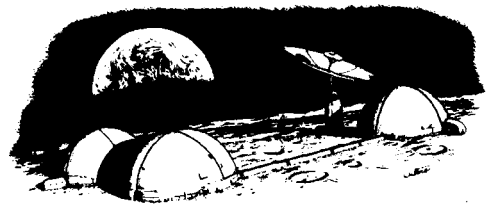
ciated—I get the impression that many international do-gooders assume that if world government ever comes, it will take the form of an empire with Us at the head, or at the very least as world policeman. There is doubt that the rest of the world will see it this way. It just may be that if we want to tell other countries how to run themselves, we must not be surprised if they volunteer to do us the same favor. And if a world government does come, we must expect to be partners in it, not tyrants. ■



1989 CLARION WRITING WORKSHOP

The twenty-second Clarion Workshop in Science Fiction and Fantasy Writing will be held from June 25 to August 5 at Michigan State University.

Writers-in-Residence will be Tom Disch, Karen Joy Fowler, Octavia Butler, Spider Robinson, Kate Wilhelm and Damon Knight.

Clarion is the oldest and most successful writing workshop in the science fiction and fantasy field. Over a third of its graduates have since published, among them Ed Bryant, Michael Talbot, Vonda E. McIntyre and Kim Stanley Robinson.

For applications or further information, write to Prof. Albert Drake, Director, Clarion '89, Holmes Hall East, Lyman Briggs School, Michigan State University, East Lansing, MI 48824-1107. Application deadline is April 3, 1989.

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From left to right: Tina Lee (for Chris Peterson and K. Eric Drexler), Jerry Oltion, Vincent di Fate, Pat Forde, Stanley Schmidt.

THE 1987 ANALYTICAL LABORATORY

For those of you who might have missed our July 1988 issue, here's a recap of all the winners:

"The Gift," *Pat Forde*—Best Novelette
"The Love Song of Laura Morrison," *Jerry Oltion*—Best Short Story
"Nanotechnology," *Chris Peterson* and *K. Eric Drexler*—Best Fact Article
January: *Vincent di Fate* for *The Smoke Ring*—Best Cover

The awards presentation was held at the United Nations Plaza Hotel in New York City on April 23, 1988, in conjunction with *Asimov's* Readers' Awards. The cocktails and hors d'oeurves were plentiful, and the many writers, editors, publishers, artists, and agents faithfully followed the old adage: eat, drink, and be merry.

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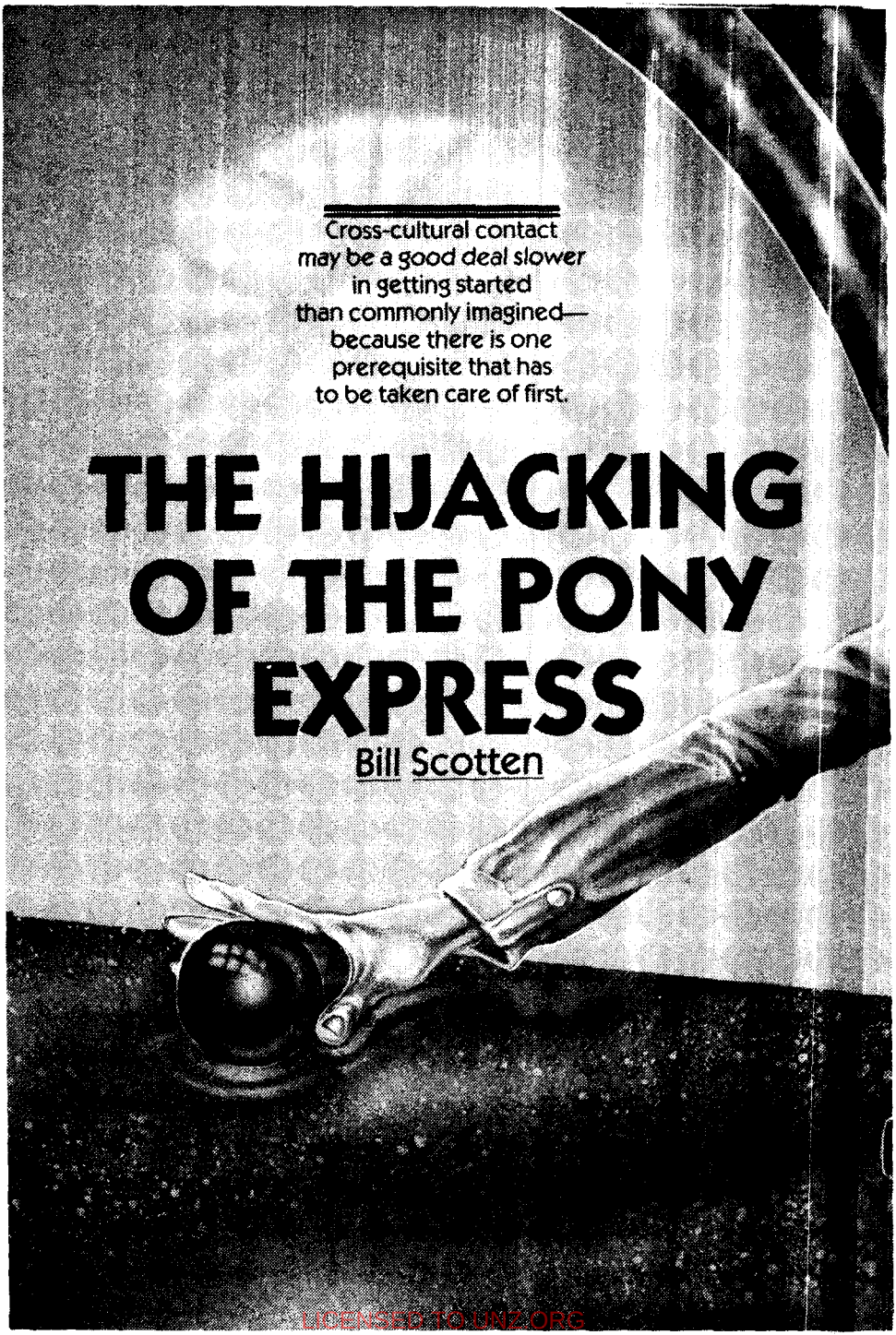

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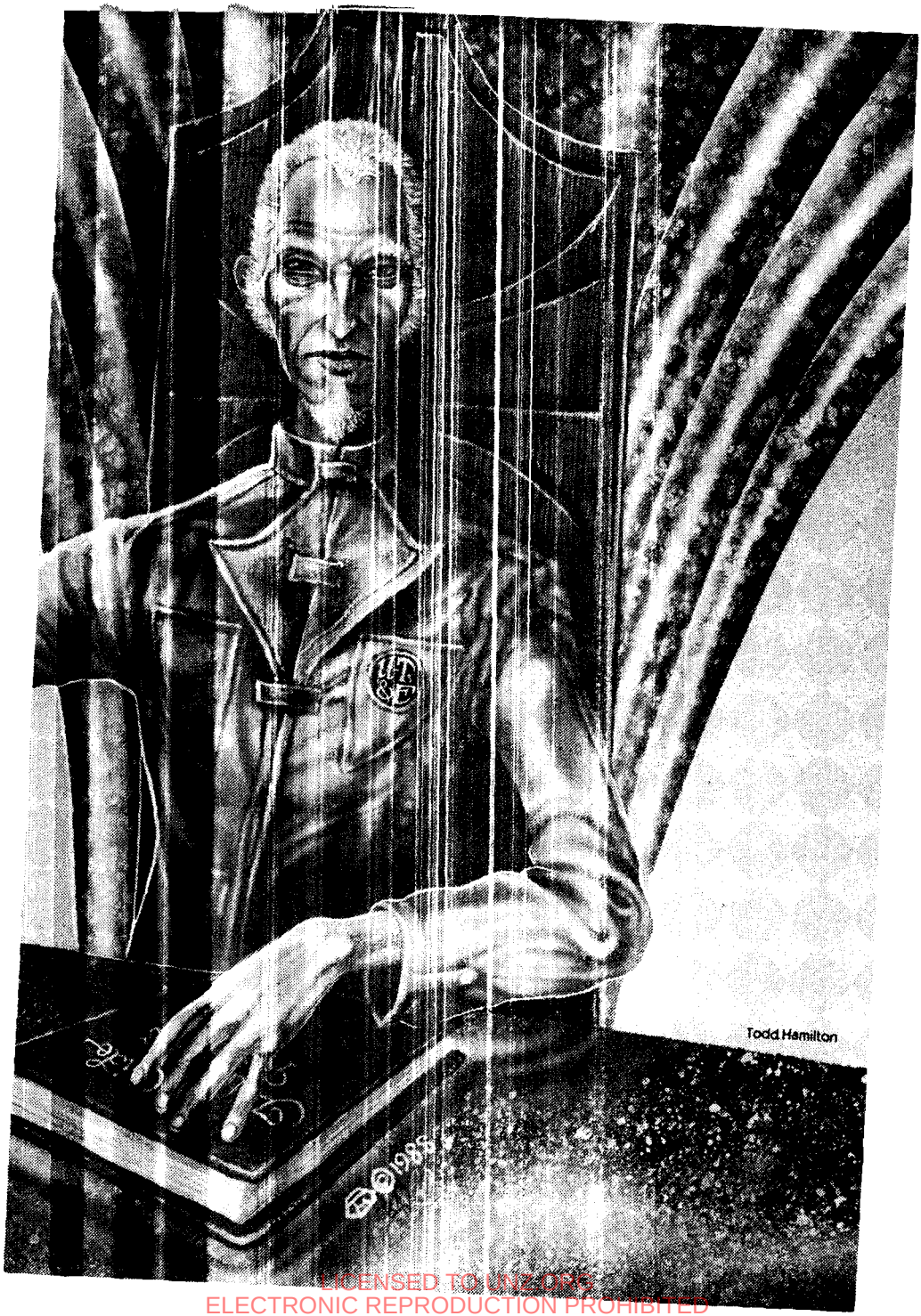

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1.

"Condition One—If both respect and trust exist between the Union of Cygnus and the alien species, register the number one, otherwise ESCAPE to next query."

From algorithm: "Describing Alien Culture Contact," Handholder Seven, Bureau of Exobiology

The grizzled lieutenant— Polyhymnia's dockmaster—punched the CLEAR button, erasing the short list of messages from the view-plate. He leaned back in his swivel chair to sip his coffee while he waited the few seconds required for the handshake, when the acknowledgement would appear on the view-plate confirming receipt of the messages at the pony. There were only three messages that afternoon: one from the dockmaster's superior, the resident union officer, and two from miners on the offshore islands; and all three were destined for Union Capital, 160 light-years away.

Unfortunately for the dockmaster, events did not unfold in the routine fashion he had become accustomed to. Instead of "Message received," he got back "Message receipt not confirmed."

In their five years on the planet Polyhymnia, that was the first time the handshake had failed to take place. It was a simple matter to diagnose the difficulty—pressing a couple of buttons and waiting the few seconds necessary for the various diagnostics to execute —and the diagnosis was that there was nothing wrong with the navy equipment at his end. That left only the UT&E equipment at the other end: the pony. And that was not his responsibility.

Still, he had an unusual superior. It paid to have as many facts as possible at his disposal before reporting to the RUO. But there was only one additional fact to determine: was the pony malfunctioning or was it missing?

He had gotten the routine message burst on its return from Vargon the day before. So it had been out there and working at that time. If missing now, it had to have tumbled and burned up in Polyhymnia's atmosphere, or been hijacked. He had no way of knowing which. That was clearly one for the RUO.

He would have to use the station lifeboat, and the chances of doing that without the RUO knowing about it were slim. Still, in the case of the RUO, taking action was better than sitting on his hands.

With a reluctant sigh he heaved his overnourished, five-by-five configuration out of the swivel chair and waddled out the door of the naval station's small, one-story, plastiform, administration building—the only building on the station grounds—which served him as office and living quarters.

He had barely lifted off when the call came: no picture, just the high-pitched voice of Albert Uhrquon, the resident union officer on Polyhymnia, a wizened, diminutive bachelor who lived alone at the Government House at the very tip of the Jahbong Peninsula. Uhrquon avoided the reaction of strangers when first viewing the imposing dimensions of his nose by disabling all but audio transmission from his holophone.

"What the hell are you doing, Chaplonsky? I hope that's you up there and not some goddamn miner."

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"It's me, Albert."

That was just like Uhrquon—to curse the miners over an open phone. It was what alienated him from the small mining community, a group of people which the dockmaster found reasonably pleasant and agreeable.

"You better have a damn good reason for being up there," the RUO said.

"I do."

The dockmaster didn't immediately elaborate.

"Is this some kind of mystery story?" the RUO said.

"The UT&E pony didn't respond to my burst at 1600. I want to see if it's out here."

"Why the hell wouldn't it be out there?"

"It may be. If so, it ain't working."

"Are you saying my message didn't get off?"

"Not yet."

"Just when do you expect to get it off, Abraham?"

"Let me get back to you on that one, Albert, after I check out the pony."

The dockmaster knew his superior had gone off the air by the click and short buzz of static that came over the lifeboat's holophone. He had put him off so as to concentrate on vectoring the lifeboat to the coordinates of the pony. But there was not a damn thing they could do, one way or the other. It was entirely up to UT&E to notice that something was wrong. And they would, of course.

He approached the geosynchronous coordinates of the pony carefully, but there was no possibility of overrunning the small vehicle. It was definitely missing. It should have been back on station at 1605, after its five minute round trip to Vargon. But then that trip had apparently never taken place. It was then 1640.

He waited until he got back to Jahbong Station before he called his superior and reported the missing pony.

"Have you notified UT&E?" the little RUO asked.

"I can hardly do that, Albert. Not without the pony."

"Well, this is a fine kettle of fish. What do we do now?"

"Nothing. Wait for them to multijump a replacement."

"And pray when will that be?"

"Plan on a day or so."

2.

"Condition Two—If respect and an advocate of trust of the alien species exist—per definition, Handholder Eight—but full trust has not yet been established, register the number two, otherwise ESCAPE to next query."

From algorithm: "Describing Alien Culture Contact," Handholder Seven, Bureau of Exobiology

The troubleshooter for Union Telephone & Express was tall and thin and solemn, bordering on ascetic, with an ample shock of white hair and a matching vandyke beard. He felt at odds with the Resident Union Officer, Albert Uhrquon, almost from the moment he stepped through the door of Government House.

The dockmaster had introduced him only as "Mr. Longine," as though the little RUO should already be aware of who he was and why he was there. He barely got a glance from Uhrquon, who

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was busily playing up to the young captain of the frigate that had brought Harvey Longine to Polyhymnia.

If the UT&E agent had possessed a clear notion of his mission, he might have fared better that evening, but the circumstances were unusual, to say the least—one of those assignments that have to be played by ear.

Uhrquon had answered the doorbell himself, and then led them into the living room where he pulled on an elaborate woven tassel that hung from the ceiling. Almost immediately, a native came in wearing an orange robe cut mandarin style with a narrow stand-up collar. That was apparently the butler's uniform at Government House.

The appearance of the natives, as the dockmaster had driven them through the Whistler village on the way to dinner, was the first thing about Polyhymnia that had disturbed Harvey Longine: the constrast with their description in the *Guide For Astronauts and Pilots*. That document—prepared and periodically updated by the Department of Commerce with charts and illustrations by the Spacetime Geodetic Survey and Planetary Graphic Center—was Harvey Longine's bible for interplanetary conduct. The *Guide*'s description of Polyhymnia's natives read, in part:

Fauna: The most evolved animal is an erect, one-meter-tall, chimpanzoid species, not yet classified, but commonly called Whistlers because of a tendency to emit monotonic whistles during emotional experiences.

The *Guide* was wrong. With a few minor exceptions the Whistlers looked like small, brown, white-haired humans, not chimpanzees.

Harvey Longine depended on the *Guide* to keep him out of trouble when visiting strange planets. It was disconcerting to find it so obviously in error, and disappointing that Uhrquon, or at least the dockmaster, hadn't corrected it. What a shot in the arm the Whistlers would be to the Union government's now small and still declining Bureau of Exobiology. In the sprawling Union, the right hand didn't know what the left hand was doing.

Longine marked the RUO down another point for lack of imagination in naming his butler Beta (and his cook Chi, and his gardner Gamma). Beta was a typical Whistler male, and the taking of drink orders was typical of the communications between the humans and the natives. Being mute, without the human vocal apparatus—having only a bird-like syrinx in place of the human larynx—the natives seemed at first to be no more intelligent than chimpanzees, as the *Guide* suggested.

But the Whistlers and the more patient humans on Polyhymnia had developed an elaborate sign language which allowed the Whistlers to respond intelligently to questions. The Whistlers had quickly picked up the meaning of spoken words so there had never been a need for the humans to use the hand signs themselves.

Harvey Longine ordered gingerbeer, the frigate captain ordered a Whistler sling, and the Dockmaster went to the kitchen with Beta to fix his own drink. The evening went downhill from there.

Through the happy hour and most of the dinner, as the little RUO pumped news from the frigate captain, Longine felt as though he and the missing pony

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were being deliberately ignored. But then, after the dinner's penultimate course, while Beta was serving dessert, Longine was brought abruptly into the proceedings.

"Now, Mr. Longine, I have here an arcane transmission from the state department," the RUO said, "arcane in the sense of deep mystery."

Uhrquon was looking at the dockmaster, not at Longine, as he pulled a yellow flimsy from his jacket pocket. He smoothed out the wrinkles, and squinted his eyes as though he were having difficulty reading or interpreting the ponypress message.

As Beta placed the dessert in front of him, Uhrquon turned his big proboscis toward Longine, canted his head back so that he stared down the length of it, and added, "By the way, are you a member of the government?"

"No," the UT&E troubleshooter replied. He knew that the RUO knew full well exactly who he was. "Technical Inspector with Union Telephone & Express."

"This message suggests that I should set up a meeting between you and one of our miners by the name of Kane. Are you aware of that?"

"Yes. Mr. Kane's message suggested that he had information that might bear on the disappearance of our pony two weeks ago."

The RUO looked at the dockmaster. "Kane has been sending messages?"

"Was there some reason why he shouldn't?" the dockmaster asked.

"Why wasn't I informed?"

"Hell, Albert, he's a private citizen. I didn't think a thing about it. Anyway, what business is it of ours? Do you want me to tell you every time a miner ponies out a message? If you do, you and I will be on the phone a good deal."

"Miners don't ordinarily pony the Union government, Abraham. That's my bailiwick, and that I want to know about."

"The message was to UT&E, Albert. Not the government."

Uhrquon turned back to Longine. "What was the nature of that message, if it wasn't so private and personal you can't tell me?"

"It was private," Longine said. "I would want to talk to Mr. Kane first, although I personally have no qualms about showing you his message. Not knowing him, however, he might consider such a unilateral action a breach of confidence."

"Did it have anything to say about piracy? That is what you're here for, isn't it? To investigate an act of piracy," Uhrquon said.

"That is a possibility," Longine said, "though, in my mind, a remote one." So, as he had suspected, Uhrquon had known who he was and why he was out here. Why did the RUO have to be so devious?

It was at that moment, with Uhrquon's deviousness filling his mind, that the nature of the table's centerpiece came fully to Longine's attention. It was a boat-shaped bowl filled with a stacked pyramid of colored balls the size of oranges. The balls were uniformly indistinguishable except for their different colors, all in a solid, dull matte finish.

It was not a striking centerpiece, which accounted for why it took so long for him to notice the dull black ball that

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shared the top of the centerpiece with a yellow one.

He was so startled he began an involuntary motion with his right hand to pluck that black ball from the top of the pile. He arrested his hand in the act, smoothly raising it to preen his beard.

"Your company executives don't think the possibility of piracy is so remote," Uhrquon said.

"We would like to talk to Mr. Kane and anyone else who may have information that bears on the disappearance of our pony."

Surely that ball was not the pony.

"Union Bell is quite capable of piracy," Uhrquon persisted.

Longine kept telling himself it was just his old paranoia acting up again. If that were the pony, why would Uhrquon display it so publicly?

"And so—in your mind—I suppose UT&E would be capable of piracy, too," Longine said, trying to keep his mind on the conversation, "if the situation were reversed, if that pony had been Bell's in Bell territory?"

"Why yes," the RUO said, "UT&E people are only human."

"Yes, Resident, they're human, and just like the Bell people. And by the same token, I think I know the Bell people a little better than you do. I've rubbed shoulders with a lot of them. Damn fine people."

"Sure. Sure."

"I would like to talk to Mr. Kane, if you can set it up."

"What kind of vessel would it take to carry off that pony?"

Did Uhrquon really not know?

"The problem is not carrying it off. Surely you know that a pony is no larger than these balls. And looks a great deal like them."

Longine reached over the table and picked up first the yellow ball, which he rolled across the table in Uhrquon's direction, and then the black ball which he set on the table in front of himself after pushing back his dessert plate, untouched.

"The problem, Resident, is concealing the little bugger once it's been carried off," Longine said. "It screams for help audibly with a high pitched siren; and visibly with high intensity alternating blue and yellow emissions; and invisibly with staccato infrared radiation. Handling that little ball inside human habitation is very uncomfortable for the inhabitants."

He looked at Uhrquon as he spoke, trying to determine from Uhrquon's expression if he had planted the pony in the centerpiece. For it was the pony—the black ball was far heavier than the yellow one—but an uncharacteristically silent, quiescent one.

After intercepting the yellow ball, Uhrquon looked at neither the yellow ball nor the black one, but instead looked at Longine with an impassive but questioning expression. If Uhrquon was the culprit, he must be an exceedingly good poker player.

Longine caressed the black ball with his fingertips, exploring the surface for the only thing that could superficially and clearly identify it as the missing pony: the tiny set of indentations bearing the stamp of the UT&E logo. He found it. That was the only Braille character he was intimately familiar with.

"Uncomfortable perhaps," Uhrquon said, "but still we wouldn't likely hear

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screams for help all the way from Kane's island to Government House, now would we?''

Uhrquon continued to surprise Longine. He could not immediately fathom Uhrquon's unexpected throught processes. Then Uhrquon's meaning dawned on him.

''Kane's message had nothing to do with ransom, if that's what you're getting at.''

''Just curious, Inspector,'' the RUO said. ''By the way, why do we have these damn ponies in the first place? Why can't I just call the boss on my holophone without fooling around with these damn flimsies?'' He was waving the yellow form he had read from earlier.

Longine glanced at the dockmaster, looking for guidance and help in diplomatically fielding such a naive question. The dockmaster was studiously examining his dessert plate. It was obvious Longine would get no help from him.

''Holophone signals travel at the speed of light, Resident,'' Longine said. ''Polyhymnia is 160 light-years from Union Capital. It would take 320 years for you to receive an answer to a question if you rang them up right now —presuming your signal had enough strength to get there.''

The RUO waited for a moment, as though expecting something more, and then said, ''You didn't speak to my question, Inspector, which was why do we need the damn ponies?''

Longine saw the RUO's problem then. Uhrquon didn't really understand interstellar travel, its inability to transmit anything but mass. The technologists were still looking for the hypothetical ''ansible'' to handle electromagnetic radiation. The pony express was the best long range communication system they had come up with.

''You're a long way from home, Resident. Holophones don't work over those distances. The best we can do is send letters by sailing vessels—in exactly the same way that news of the American revolution got to King George.

''We do that with our ponies. Like all other interstellar vehicles, they jump instantaneously from one place to another, limited only by Hartsfeld signal degradation. To maintain 100 percent jump signal fidelity requires seven jumps between here and Union Capital. The ponyex relay stations are naturally located near six other inhabited planets which share the chain with Polyhymnia.

''The pony assigned to each planet jumps inward once a day; bursts its load of ingoing messages including all those received from outlying stations; waits on station at the inward planet for the few minutes it takes for the wave of inward jumping ponies to reach UC, and return as a wave of outward jumping ponies; receives its burst of outgoing messages that have been relayed from all inlying stations; and jumps back to its home base, to burst that load and then wait on station to receive the day's traffic from its own planet.

''With the exception of UC and Polyhymnia, each planet in the chain has two ponies on station during two ten-second overlap periods when messages are being burst, first inward and then outward.

''Does that speak to your question, Resident?''

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Longine delivered that long explanation rapidly, hardly pausing for breath, as though he were repeating it by rote, which of course he was. With minor modifications, he had recited it often.

The RUO stared at Longine, then abruptly turned to the frigate captain and said, "You're welcome to bunk here at Government House, Captain Parsons."

"How can I get to Kane's island, Resident?" Longine asked again.

"Chaplonsky will arrange that. He'll put you up for the night as well."

Uhrquon pushed back his chair and stood up. The visit was over apparently.

What should he do? Longine felt that to walk off and leave that pony lying on the table would be the most irresponsible act of his career. Yet if he slipped it into his pocket and got caught in the act, its true nature would surely come out, and that would be tantamount to accusing the RUO of piracy. Hardly the best way since there was no evidence to start a fruitful investigation of the now-not-missing pony, particularly if the RUO was innocent.

Yet whoever had taken the pony, whether it was Uhrquon or someone else, apparently wanted a confrontation, so why not get it over with? That might just be the quickest way to resolve this affair.

And so, Harvey Longine's first evening on Polyhymnia had not gone as he had expected. He had been forewarned about Albert Uhrquon, that much he had expected. But little else.

He placed the pony back atop the pyramid of balls and walked out of the house with the dockmaster. He might not be in control of the situation, but that was better than playing into the hands of his unknown adversary.

3.

"Condition Three—If trust of the alien species exists, and respect is possible but not yet established, register the number three, otherwise ESCAPE to next query."

From Algorithm: "Describing Alien Culture Contact," Handholder Seven, Bureau of Exobiology

The frigate captain had given Harvey Longine a brief description of both Albert Uhrquon and Abraham Chaplonsky—personalities and careers—while the frigate was making its approach to Polyhymnia. Longine learned little more from the dockmaster during what was left of the evening, but he did try for a few pieces of other information.

"How is it that the *Guide For Astronauts And Pilots* has such poor information about the Whistlers?" Longine asked as they were driving back to the naval station. "They seem almost as inntelligent as we are. And they're certainly not chimpanzoid."

"Chimpanzoid? The *Guide* says that?" the dockmaster said. "I haven't seen a *Guide* in years. Somebody ought to correct that."

But, jolly and carefree, the dockmaster didn't seem on fire to do so himself. And though his probing had been subtle, Longine sensed a reserve in the dockmaster's manner—a reluctance to discuss either the case of the purloined pony or the nature and peculiarities of the resident union officer—which seemed out of character with what appeared to be the dockmaster's open and overt na-

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ture. Longine did not press him further. There wasn't much point in pursuing soft leads until he knew more about the tenuous but hard lead that Kane had offered.

The dockmaster might be more frustrated by career developments than he let on, and could be striking back at the system by hijacking a pony, but he didn't seem a likely pirate, not nearly so likely as the RUO who carried his career frustrations on his sleeve. It was difficult for Longine to be objective about Uhrquon, he had such a strong personal reaction to the abrasive nature of the little RUO.

Either of the government officials could have used the station lifeboat to hijack the pony, to indirectly get back at a government—a set of higher-ups—he may have felt had been personally abusing him. Longine had seen similar situations precipitated by far less motive. Still, neither of the two officials had reacted to Longine's play with the balls from the centerpiece during dinner. They could have been acting, but Uhrquon seemed genuinely surprised that a pony could be so small, and neither seemed to realize that he was seeing one that evening.

The next morning at sunup—after a quick but ample breakfast—the dockmaster drove Longine to the pier opposite Kane's island, where Kane was to meet Longine and take him out to the island.

Polyhymnia's rotation was close to the twenty-five hour cycle of Neosiberia, Longine's home planet, so there was little of the alien feeling of a different planet. The sun, bright red but not yet blinding, was rising between two of the offshore islands, and was bisected to a half disk by the sharp horizon of the sea east of the peninsula. It looked normal, just as normal as its yellow cast of the afternoon before, just like the sun of Neosiberia, which according to his parents, looked just like the sun of Earth. The Milky Way was filled with look-alike solar systems.

The village south of the spaceport was quiet. According to the dockmaster, the Whistlers kept no pets, so there were no dogs barking, and they were vegetarians, so there were no roosters crowing, and they retired early when the sun went down because there was nothing else to do, and they got up late because it seemed like the best thing to do. There was no need to get up earlier—except for those natives in the employ of Union establishments—nor to proceed faster than was necessary to match the beat of a carefree, leisurely life on the edge of a jungle which, within an hour's walk, provided them with all the nuts and fruits and vegetables needed to sustain life.

Longine wondered then how it was that the miners were able to get the Whistlers to work the mines. He didn't ask the dockmaster. That was a question more suitably addressed to Kane. But the operation of the mines was entirely dependent on the Whistlers, as was the operation of every other human facility and establishment on Polyhymnia. All told there were only twelve humans on the planet: the RUO, the dockmaster, six miners, and four wives of miners. And now Longine swelled the population to thirteen.

On the way to the pier, Longine asked

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the dockmaster for a brief biography of Wendall Kane. He got very little because the dockmaster seemed to know very little. Kane was a decent sort, a closemouthed bachelor. He kept to himself and was rarely seen off the island except when he barged hema crystal to the mainland.

That seemed to wrap up the dockmaster's assessment of Kane, and then he chuckled and said, "And maybe he's achieved the impossible. Some of the miners think he's got something going with one of the Whistler women." For a moment Longine felt as though he was seeing the real dockmaster, but that was the extent of it. He lapsed into silence.

When they arrived at the pier—which was used mainly to unload barges of hema crystal from Kane's mine—Kane was already waiting in a small, sleek runabout. Chaplonsky introduced them to one another and promptly drove off.

Kane was a big man, weighing well over two hundred pounds, with a full, black beard and a smooth, unwrinkled face except for deep crinkles at the corners of his eyes. He seemed about as worry-free as the dockmaster.

The minute the dockmaster drove off, Longine asked Kane to amplify on his ponypress message to UT&E's office on Union Capital. Longine could have shown that message to Uhrquon and no harm would have been done, least of all to Kane's sense of privacy. Longine's refusal was a childish reaction to the RUO's irritating personality.

Kane's message had said simply, "Have information relating to ponyex vehicle missing from Polyhymnia station."

That request for amplification was the first thing out of Longine's mouth when he stepped onto the boat.

Kane simply said, "Motor's too noisy for conversation." And immediately cranked the small coal-fired outboard until it coughed, belched a plume of black smoke, and settled into a quiet, steady purr that made conversation uncomfortable but far from impossible.

When they reached the pier on the mainland side of the island, Kane jumped onto the dock, tied up the small boat, and stepped back into the cockpit. He opened a compartment, took something out, and then turned with the object in his extended hand.

"Recognize this?" Kane asked.

It was the size and shape, and had the black, dull matte finish, of a UT&E pony.

The first thought that popped into Longine's mind was of the little RUO and his implication that Kane might be a pirate, that Kane had sent UT&E a ransom note. Here was the hijacker standing with the goods in his hand about to demand his ransom.

Instantly, that seemed ludicrous, but left the question of how the pony, overnight, had got to Kane from Government House.

"Nothing surprises me this morning, Mr. Kane. I presume you know that last night that pony occupied the topmost position in the centerpiece on Uhrquon's dinner table?"

Kane looked surprised, but shook his head. "Not so Mr. Longine. About the time you must have been eating dinner, I had that pony sitting on my desk, weighing down paper while I did my bookkeeping."

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"I wasn't aware there had been two hijackings?"

"Nor I," Kane said.

"Then the pony you have there was the reason for your message?"

"Most certainly."

"And most curious," Longine said. "UT&E is not aware of losing two ponies. Exactly how did you acquire yours?"

"It was on my desk one morning. I'd had a meeting of the miners at the House the night before. One of them must have left it there. The bastard has sucked me into a most sticky business. I knew immediately I was being framed and that my best defense was complete openness. I ponied UT&E as soon as service was restored.

"But it all seems so stupid, Mr. Longine. In god's name, what is to be gained by involving me in hijacking a pony? What possible motive has he dreamed up for my alleged action? How could it possibly benefit anybody?"

"You must have someone in mind," Longine said.

"No, I don't. I consider them all my friends. We're not close. I don't socialize a lot. But everyone of them owes me a great deal. I'm responsible for them being here; I got them set up and established, to keep the Monopoly Board out of my hair, to show competition.

"That's about all I can take time for right now," Kane said. "I've got to check on the mine. But I've got a full day planned for you, to keep you out of circulation until I can acquaint you with our planet and its natives."

With Kane's information, Longine had already been making plans to query each of the other miners, but the brusque words of the big miner clearly postponed that unless he wanted to swim back to the mainland.

Kane's plan for the day was to inspect the hema crystal mine that lay on the mainland side of the narrow island where they had landed; to journey to a favorite haunt of his—a spectacular waterfall a few miles south of the mine—and there eat the sandwiches which he was carrying in a small wicker basket; to come back in the afternoon to check on work at the mine; then to visit the Whistler village, which lay inland from the mine, for dinner and an evening of native entertainment.

Kane's wry smile left Longine puzzled about the nature of the entertainment but not inclined, on such short acquaintance, to query further.

Kane had ready a pair of riding clops, the ungainly beasts of burden that served the Whistlers as horses. Longine had never ridden a horse—there were none on Neosiberia—and he was reluctant to put himself at the mercy of what looked like an even more temperamental beast. He was remotely acquainted with horses. His parents had been horse lovers and had shown him holovision cubes of their experiences with horses on Earth.

A clop, with its mean-looking tusks, big ears, thick heavy legs, and hairless gray hide, looked a great deal like a small thin elephant without a trunk. Longine found, much to his relief, that he did not have to learn how to ride one. Either they were exceedingly well trained or they were the most natural beasts of burden ever encountered by the human race.

It was a short, pleasant ride through low hills to the hema mine: a large pit, several hundred yards across and at least

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a hundred yards deep, typical of open pit mines.

There were surprisingly few Whistlers around. Longine had expected to see a swarm of workers. He counted, instead, a total of seven supervising the operation of the complex, automated, mining machinery.

Kane introduced Longine to his foreman Pete. After shaking hands, and receiving the foreman's grin and whistled response—a monotonic reverberation at a pitch far lower than any Longine had heard up to then—Longine watched the mining operation while Kane and his foreman conducted a brief business discussion: Kane talking, and the foreman gesticulating with his hands in sign language like a mute, but not deaf, human.

Except for being a trifle more stocky, Kane's foreman looked exactly like Uhrquon's butler: a little more than a meter tall; dusky, brownish red skin; muscular limbs and torso, beautifully proportioned in the human sense; fine features with the too-sharp Whistler nose; jet-black eyes with no whites; long pendulous ear lobes which just missed touching the shoulders; a full head of well-groomed, snow-white hair, typical of both young and old.

At the end of their unusual dialogue, Kane said, "Mary told me about your father, Pete. I'm so sorry."

A flurry of the foreman's hands and a deep whistle, and then, Kane said, "Yes, we had planned to meet Mary for dinner at the village."

Another flurry of Pete's hands, and then, "Thanks, Pete, we'll see you there."

It was still a half hour before noon when they got to the waterfall: an awesome three-hundred-foot drop that ended in a boiling basin of spray, foam, and fog.

They tied their clops to a tree, and Longine sat down on a boulder to absorb the splendor of the falls.

Kane said, "Not time to sit yet. We came up here to eat lunch, but I also had another reason for bringing you here. I want to show you the birthplace of the Whistlers's preparation for death."

Longine started to open his mouth, and Kane said, "I'll explain as best I can, but I don't have all the answers yet myself. I'm hoping to get a few more tonight."

He led the way to a rocky ledge that disappeared into the fog in back of the falls.

"Keep one hand on the wall and the other hand on my shoulder and you'll have no trouble," Kane shouted above the roar of the water, and he started out onto the ledge and entered the fog.

He couldn't see Kane, but Longine did as he was instructed. It was a lot like being in a small flyer in the middle of a cloud except now the cloud clung close around him, right up to his eyeballs. Then the whiteness of the cloud was overtaken and swallowed by dense darkness which, after a few steps, was shattered by the bright beam from Kane's flashlight probing through the mist.

Now they were walking in a cave, a tunnel that led deep into the rock. The mist thinned and disappeared, the reverberation of the falls faded to a murmur, and they emerged into an open chamber that was perhaps forty feet from front to back. The floor was covered by pumpkin-size, white, fuzzy sacs.

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"This is the birthplace of the Whistlers' death shrouds," Kane said. "The white globes are chrysalides containing the pupas of a large insect-like organism. The Whistlers keep the adults in their homes—more like pieces of mobile furniture than housepets. Every Whistler acquires one at birth. Caskets. That's what I call them. Sort of living caskets as best I can determine."

"Are you saying caskets, like in funeral caskets?"

"Yes."

"How can a living insect be a casket?"

"We're going to attend a funeral tonight. If you keep your wits about you, and don't consume too many Whistler slings, maybe we'll get an answer to that. Funerals are very jolly affairs on Polyhymnia. I have only hazy recollections of the only one I ever attended, about a year ago.

"I was pretty well soused, but as near as I can remember, they laid the corpse's casket on its back in a big wooden pan on a sort of altar, and without a knife or anything, just their bare hands, they slit that sucker's belly from one end to the other. The slit stood brimful of a green liquid. Then they lifted the corpse, and stuffed it into the casket, down into that green stuff, accompanying the operation the whole while with a bunch of tuneless whistling, and naturally spilling a good bit of the creature's juice into the pan in the process. It was a tight fit but they got him in and then just seemed to squeeze the casket together again.

"That's the last thing I remember before I passed out. So you can see why I call them caskets. The Whistlers accept my terminology but that doesn't necessarily mean I've got it right. The subject doesn't seem to hold any particular horror for them; that's why I may not have it right. Just seems to be part of their life."

"Why are you telling me all this?" Longine asked. "The only thing I'm really interested in is finding a hijacker, not discussing grisly native rites."

"You can afford to lose a day, thinking of a way to keep me from getting anymore involved in that hijacking than I already am. And I don't want the Whistlers involved at all. I'll not have them hurt by you or Uhrquon or anyone else. I thought you ought to know as much about the Whistlers as possible—in order not to hurt them. That's another reason I ponied UT&E, so I'd get my crack at you right up front. Do you understand?"

"I've no reason to hurt them," Longine said.

"No doubt. But that can happen without you intending to."

Kane led the way out of the tunnel and several hundred yards down the slope to a secluded glade where the sound of the falls was not quite so deafening. After Kane's revelation of Whistler funeral rites, Longine sensed that Kane felt a little more comfortable with him, and Longine broached the question of the *Guide*'s misinformation regarding the Whistlers.

As Kane laid down a ground cloth for them to sit on, Longine said, "If you're so enamored with the Whistlers, why haven't you corrected that totally sad description of the Whistlers in the *Guide For Astronauts And Pilots*? Surely you're familiar with the *Guide*. I don't under-

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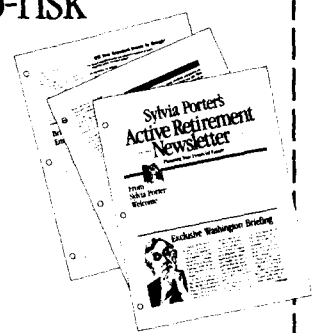

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stand why Uhrquon himself hasn't corrected it."

"Uhrquon's probably never even heard of the *Guide*," Kane said.

"You obviously have. Why haven't you corrected it?"

Kane started laying out the lunch on the ground cloth.

"Because I'm responsible for it."

Kane hesitated, as though inviting Longine to say something. Uncharacteristically, Longine didn't. He simply picked up a sandwich and started munching on it, waiting for Kane to continue.

"I was the first one here. I scouted the planet, found the hema crystal on the offshore islands, and wanted as little government interference as possible while I developed the planet's commercial resources."

"I don't see what that has to do with suppressing the true nature of the Whistlers," Longine said. "As a matter of fact, the government is here now and interfering as little as you might expect."

"That's because it's my government."

"How so?"

"How do you think a paranoid, little recluse like Albert Uhrquon could be promoted to the job of resident union officer—even way out here? RUO's enjoy a certain prestige and command considerable respect, no matter where they are."

"You had something to do with that?"

"Everything to do with that. Albert Uhrquon was a disgruntled flunky in the Bureau of Exobiology before I pulled strings and got him transferred out here. He gets under my skin occasionally, and now and then I have to step in and mediate him out of difficulty with a miner, but otherwise he's the ideal RUO for us. All my colleagues recognize that."

"But what's all that got to do with the Whistlers?"

"The Captain Cook Syndrome. Surely you're heard the legend of how Captain Cook and his commerce decimated the native population of Earth's Hawaiian Islands back in the 1800s. Fear of that is what created the Bureau of Exobiology in the first place, and what made it such a humongous organization in its early days. They had xenologists snooping around everywhere until The Depression. And now that The Depression and the lack of hard business has reduced them to manageable proportions, I don't want them ever to get unmanageable again."

"I've heard of Captain Cook vaguely, but I didn't know he was responsible for a syndrome. Tell me more."

"Man, if the Bureau of Exobiology knew about the Whistlers, this planet would *be* the Bureau of Exobiology. A Whistler wouldn't be able to set foot in our mines without the Bureau and all the other bleeding hearts in the Union screaming 'exploitation.' Can you imagine a better RUO for us than one who hates the guts of all the bureaucrats in BOE, without exception? Even if Albert knew about the *Guide* he'd not do anything about it."

Harvey Longine knew that he, personally, would have to do something about it.

4.

"Condition Four—If both respect

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and trust of the alien species are possible, but neither has been established, register the number four, otherwise ESCAPE to next query.''

From algorithm: ''Describing Alien Culture Contact,'' Handholder Seven, Bureau of Exobiology

When they arrived at the Whistler village that evening, Wendall Kane immediately sought out a female Whistler, named Mary, who stayed close by his side the rest of the evening.

With the coal black eyes of all Whistlers, but with a slightly broader, more human-like nose, Mary showed a shade more human beauty than the too-fine features allowed typical Whistler females. Even so, the other females seemed just as charming and attractive to Longine. He could see why Kane had been drawn to Mary, or could have been drawn to any of the females, for that matter. But it was not clear what else, beyond her beauty, had led to what was an obviously close relationship.

If sexual, it could not have been normal, because that was not physically possible. The dockmaster had made that much clear during the ride to the pier. But he seemed to know little else about Whistler biology. Kane himself seemed curiously ill informed on that subject to be so close to a member of the tribe—ill informed or perhaps reluctant to discuss it because of that intimacy.

The communal dinner at the island's small village was a surprising blend of what Longine later described as rural simplicity and urban sophistication. The dinner was served in the open on a low wooden platform at several long, curved tables arranged in a single large ring around a central, knee-high, bare dais. Everyone faced the dais, sitting on curved benches on the outside of the circle of tables. There seemed to be no one in authority and no one seemed to occupy a location in the seating arrangement that spoke of any such authority.

It was already dark, but the dining area was brightly lit by torches set atop four posts at the perimeter of the dais. The smokeless torches created a brilliant white light reminiscent of the glow of a thorium dioxide mantle.

The dinner was sumptuous. The multitude of dishes with their exotic sauces—all vegetarian—would have been welcomed at any of the Union's better restaurants. Longine seldom knew what he was eating, but it was all delicious.

The table ritual, though strange, was nonetheless rigid, and after a little thought, could be seen to derive like most etiquette from practical considerations.

The table talk, or lack of it, was equally strange, yet Whistlers were smiling and nodding and responding with bursts of emotional whistles just as though they were talking. Gossip and other information were certainly being exchanged but Longine was frustratingly unaware of how it was taking place. That was the ultimate in frustrations for a communications troubleshooter.

He was forced to conclude that it had to be telepathy, and that would be a first for the Union, something held out as the ultimate in personal communication, claimed often by individuals who could be politely described as not in the main stream, but never rigorously substantiated anywhere by any human society.

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But then the Whistlers were not human, and no nonhumans had ever been encountered before, so the human race had little to go on in sizing up this first, intelligent, nonhuman species.

With the exception of that ultimate conundrum, the early evening passed in a pleasant, teetotal blur for Longine. Kane's blur, Longine noted with distaste, was initiated by a single Whistler sling before dinner and prolonged by frequent small sips from a glass of red nectar which Mary never let run dry.

Longine was finishing a delicious dessert when everyone at the large dining circle stopped their indulgent, responsive whistling, and he became aware of a keening ululation of harmonizing whistles which was coming from beyond the far side of the tables.

Then, far in the distance, across the deep grass of the meadow that lay toward the seaward side of the island, Longine saw two brilliant white lights coming toward the village.

Everyone in the dining circle was absolutely silent. The only sound came from across the meadow, the mournful keening coming from what was obviously a funeral procession.

When the procession drew near, Longine could make out three separate groups, and as they drew nearer still, he resolved the groups into individual figures. At front and rear, a Whistler holding a torch sat with legs folded atop the long body of a green creature which moved with a slow deliberate alternation of its six legs.

In the middle of the small procession, Longine could make out twelve other Whistlers carrying a dished tray just large enough to support another of the green creatures. It rested with its six legs folded so that the middle joints projected above its recumbent body. Then Longine could see that the folded legs formed a screen which fenced in a Whistler, an obviously dead Whistler, lying on the slightly concave top of the creature's long body.

A bulbous head with two multifaceted eyes scanned slowly back and forth from the end of a short, thick neck at the near end of that strange Polyhymnian beast on the tray, as though it were wary and still guarding its dead master.

As the procession came to the dining area, the front torchbearer on his beast split off to the left and proceeded around to the other side, taking up a position opposite the opening in the tables through which the tray bearers now proceeded to the dais. The rear torchbearer stopped short of the dining platform, taking a post behind Longine and to his left and diametrically opposite the first torchbearer.

The tray bearers set the tray down in the middle of the dais, then six of them—three to a side—lifted the body of the guest of honor from atop its casket, as Kane would have termed it, stepped down the length of the beast until they stood off the tray, and then remained rigidly attentive.

For some time nothing happened on the dais, and Longine was beginning to wonder what was going on when he noticed the activity near the torchbearer on the opposite side. He looked at him closely now, for the first time, and recognized Pete, the stocky foreman he had met at Kane's mine.

Longine was sitting one table away from the opening through which the cas-

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ket bearers had filed so he had a good view of Pete, not blocked by either the tables or the dais. And he had only to turn around to see the other torchbearer close at hand. But he did not do so. No one else had turned around. All sat with attention rigidly fixed on the dais, as if that were necessary to preserve the guest of honor in an adequate state of grace. But Longine could hear the slight activity behind him and longed to turn and see at first hand what he could see was similarly going on at a distance on the other side of the dining area.

With torch still in hand, Pete had dismounted from his beast when two Whistlers came up with a dish tray like that on the dais. They set the tray down alongside the six-legged beast, the beast stepped onto the tray, Pete handed his torch to one of the tray bearers, disrobed, folded his clothes neatly, and handed them to the other tray bearer. The alien genitalia at Pete's crotch —taken as a measure of the typical female's receptor—made it clear why the relationship between Kane and Mary must be strictly platonic.

Pete knelt beside the beast. In otherwise total silence, a short series of soft, staccato whistles came from behind Longine, and at nearly the same time a similar series from Pete's direction came across the platform, delayed by a fraction of a wavelength so that those farther notes beat with the near emissions in a low vibrant thrumming that added a further dimension to the sound.

The staccato cadence gave to those notes the aspect of a command, the first time Longine had heard a whistle that seemed to transmit hard data, communication of hard intelligence. It was perhaps his imagination, or perhaps that low, thrumming, reverberating beat, but Longine thought he detected the more natural overtones of emotion as well, a plaintive note as though in supplication, almost apologetic. The command, coupled like that with emotion, was appealing and compelling even to Longine.

Still kneeling, Pete laid his hands on opposite sides of his beast's back, grasping the ridges that defined and bordered the shallow depression in which he had just been sitting. Then, pulling with his near hand and pushing with the other, he split the beast open in a great slit that ran from the base of the neck to the pointed other end, and exposed a green ichor which filled the beast and spilled partially from the open slit into the tray. Simultaneously, Longine heard from behind a soft, abrupt, sucking sound.

Pete took a small cloth from the Whistler holding his clothes, stepped into the tray, and dipped the cloth into the green juice filling the beast. He swabbed the bottoms of his bare feet with the cloth, handed it back to the other Whistler, and then slowly and carefully, so as not to spill any more of the green juice than necessary, moved on hands and knees into a kneeling position in the middle of the beast's insides, and then easing himself into a prone position, he slowly slipped below the surface of the green ichor as the overflow spilled into the tray below.

The Whistler holding Pete's clothes placed the clothes on the edge of the dining platform, then knelt and grasped the two ridges of the beast's back, and

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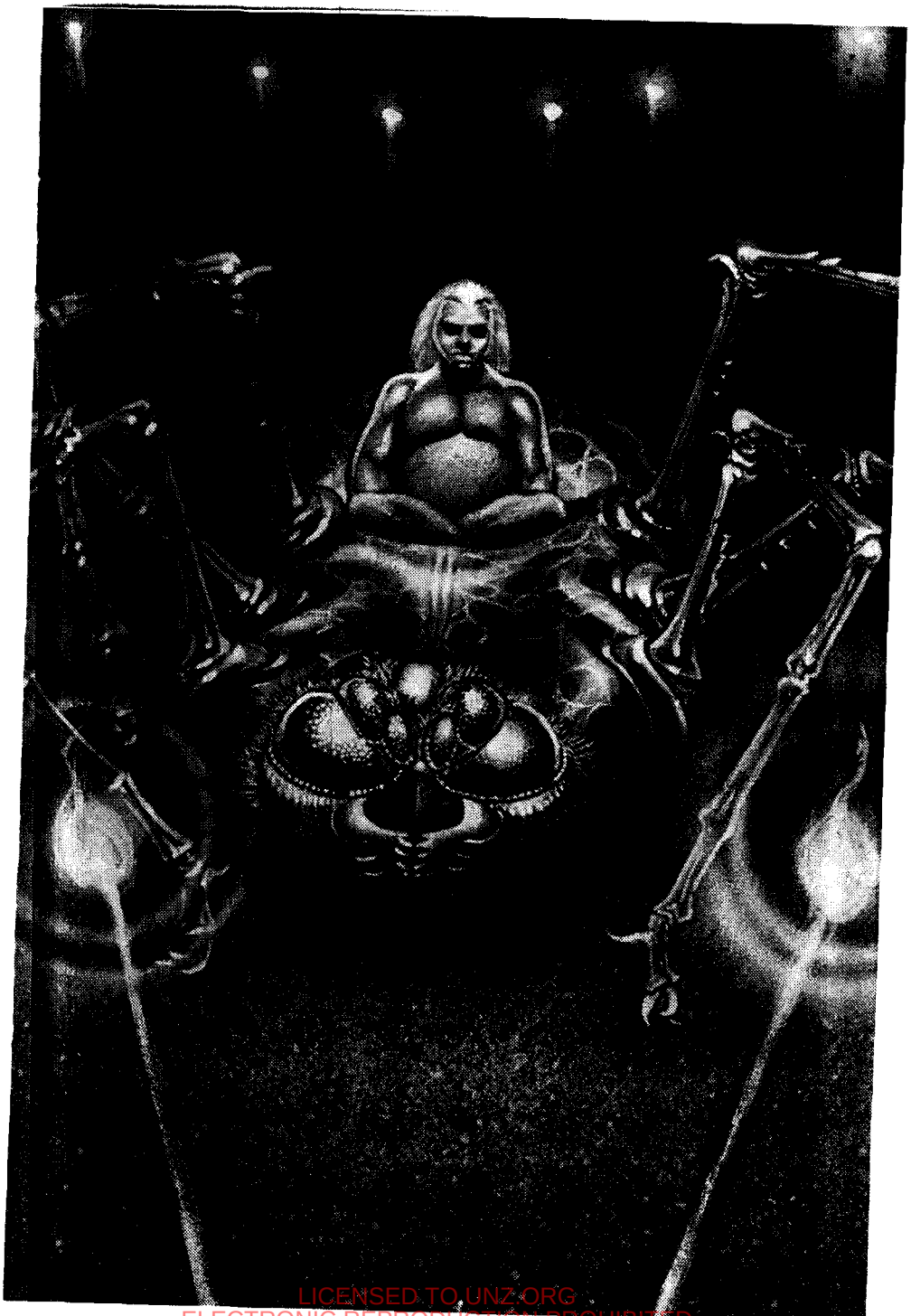

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slowly forced the slit closed. At that moment a faint, final pop came from behind Longine as that beast's back was also closed completely.

This was hardly what Kane had described to him. Weird as that was, this was far more so, like live human sacrifice. He looked at Kane who was sitting on the other side of Mary, on her right. The consternation that registered on Kane's face told Longine that this was nothing like what Kane remembered through the drunken haze of his only other Whistler funeral experience.

The shuffling of feet brought Longine's attention back to the dais. Six tray bearers were now kneeling, three on each side of the beast on the tray, while the other six holding the corpse, still stood rigidly at attention. Again that soft plaintive staccato drifted to Longine's ears, this time from six syrinxes, and now six pairs of hands did for each of the torchbearers' beasts what one pair had done before, splitting the back of the beast on the dais into a long slit.

The ritual on the dais now seemed anticlimactic in the light of what Longine had just seen and of what he had been told at the waterfall. He knew what was going to happen, but he watched in fascination nonetheless as what was in his mind was played out before his eyes. Kane, in his inebria, had got the beast's belly confused with its back, but otherwise his hazy recollection was right on target.

When the corpse was fully encased in its living casket, the new torchbearers led the other two beasts across the platform to the dais. The beasts no longer walked with the smooth and natural motion of six legs that had characterized their movement across the meadow: the effortless alternation from one tripod to the other that provides an insect with the upright stability that a two-legged human achieves only by a delicate balancing act, guided by an inner ear. The beasts with their internal humanoid burdens seemed to move more carefully now, as though the smooth transition from one tripod to the other was not altogether a thing to be unconsciously expected.

Pete's beast lowered its body to the floor of the dais in front of the casket and splayed its legs out to each side, flat against the floor for a reason that became clear when the corpse casket walked out of the tray, straddled Pete's beast on the floor, and lowered itself to nest on Pete's beast, in the shallow depression on its back, head above head, tail above tail.

Then the beast of the second torchbearer literally climbed upon the other two and settled itself down so that it was headed in the other direction, that is, head to tail. Now the three reposed together, one upon the one below, like a set of nested kitchenware.

It was when the last beast was climbing upon the other two that Longine noticed its feet. The beast used them like hands to grasp the legs of the beast below and pull itself into position. Each leg was equipped with three claws, four to five inches long, one claw opposed to the other two, so that when closed together, the fisted set of claws served as a foot.

The torches were transferred then from the two Whistlers, who had been standing just off the dais, to the the top and bottom beasts who each grasped a

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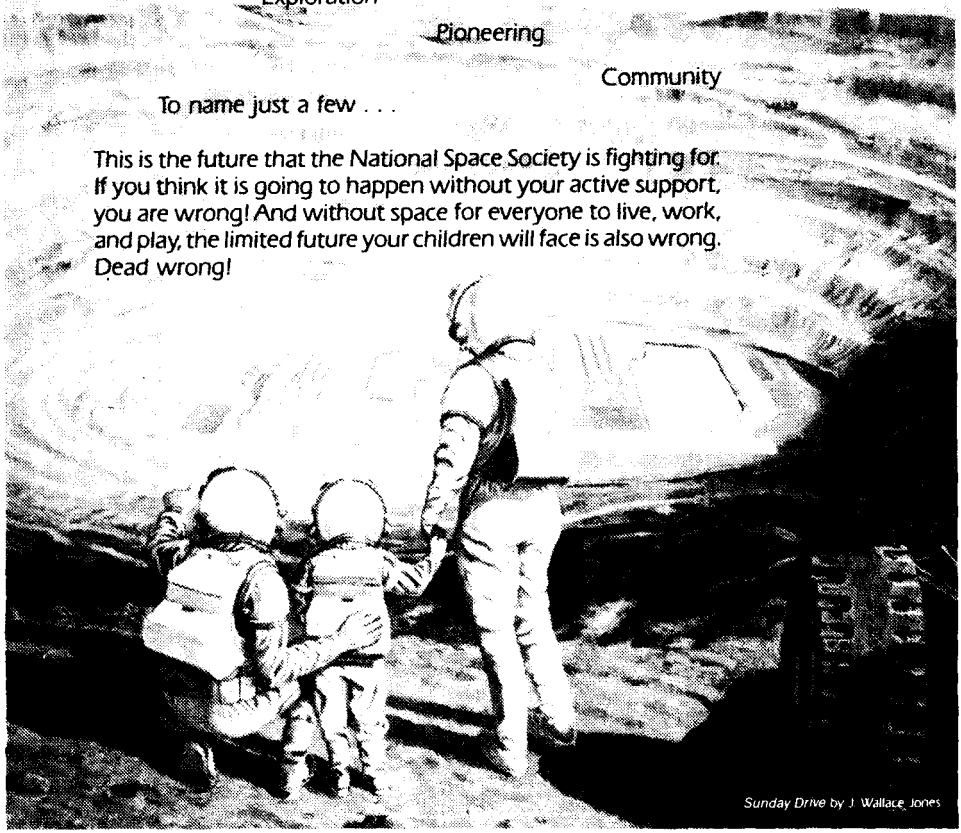

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torch with a front fist so that the assemblage, the funeral bier, had a light at each end, illuminating the path forward and the trail aft.

As the torches were being transferred, Longine heard Mary begin whistling, softly, plaintively, at her own natural resonance which now appeared to be harmonic, like that of all of her companions of the central pitch in the distribution of the crowd; for now they were all whistling, but so softly Longine had not noticed at first.

He was scanning the crowd while trying to give the appearance of staring straight ahead so that he almost missed the first blink of the funeral bier. But it was that blink, the accompanying swoosh of air, and the roiling cloud of dust, that brought his attention back to the dais.

The bier, torches and all, had winked out of existence for a fraction of a second, returned for a fraction of a second, and then blink, was gone again, blink was back, blink was gone, and now it was apparent to Longine as the blinking and swooshing continued, that the bier was moving up into the air, in tiny jumps repeated rapidly enough so that the air had time to move only part way into the vacuum before the bier had returned, only a small fraction from where it had been before. It seemed only a short time before it was far overhead, taking big jumps, accompanied by crisp but faint sonic booms which now faded away completely, and then far away, miles and miles away, it finally winked completely out of sight.

Longine sat there quietly, eyes still on that spot in the sky where he had last seen the bier, and then the whistling, which had gotten louder with each blink, stopped abruptly, as though the crowd in unison had obeyed some silent command.

Longine looked over at Wendall Kane and found Kane looking at him with a dazed expression on his face. But neither said anything, for the crowd was silent now, no one moving, no one whistling, all still staring at the sky where the bier had disappeared, as though in some hypnotic trance. Then, just as abruptly as they had stopped whistling, they all resumed whistling, but now the mood was not mournful, but light and gay. They stood up then, first one and then another, until they were all milling around inside the tables, laughing and whistling.

Longine was at a loss as to what was going on until Kane, seeing his confusion, pointed overhead to where two blinking lights, one behind the other, were descending, and then Longine could hear the faint sonic booms which changed to a swooshing and roiling as the two beasts bearing torches came to rest, first one and then the other, side by side on the dais.

The torches were taken from them and extinguished, and once again with that apologetic whistle, the backs of the beasts were split open, and two Whistlers, coughing and gasping and dripping green ichor, were helped to their feet. Then still gasping and coughing, but before doing anything else, each filled his beast to overflow with green juice from several cloth bags, pulled the sides of the slit together with a pop, and washed the beast down with a spray of water from another cloth bag.

Then each turned to the other, and

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with much whistling laughter, washed each other down.

With Mary between them, Kane and Longine stood in the front ranks of the crowd of jovial spectators, watching everything in silent fascination. Each had a tiny hand of Mary's cupped in his huge hand, each derived a small measure of comfort from the feel of that small hand, from the reassurance that passed from Mary to them, for each at that moment was feeling a sense of racial anxiety. They both knew they had seen a demonstration of Hartsfeld jump technology without benefit of hardware, without benefit of the human version of jump technology.

It was a sobering experience.

5.

"Condition five—If respect for the alien species is possible but not yet established, whereas trust is impossible, register the number five, otherwise ESCAPE to next query."

From algorithm: "Describing Alien Culture Contact," Handholder Seven, Bureau of Exobiology

Harvey Longine was bone weary when he got to Kane's home on the shore of the seaward side of the island. The three of them, with Mary in the middle, had ridden silently on their clops across the large grassy meadow with only Polyhymnia's scant starlight to guide them, until they could see the light shining from windows on the lower floor of Kane's house.

They walked into the living room of the large plastiformed structure a little after 10 P.M. At that point Longine fully expected to be shown to a bedroom immediately, and welcomed the idea, but Mary went upstairs by herself when Kane told her that he and his guest were going to linger awhile downstairs. Longine—tired, and with expectations to the contrary—was disappointed, but that was soon forgotten.

During the long ride home, the strange relationship between Kane and Mary had been pushed out of Longine's mind by the eerie events of the evening. But on entering the house, their unusual concern for one another was brought back to mind by the domesticity of the living room scene. They were certainly living together, if not sharing the same bedroom.

And the question in Longine's mind must also have appeared on his face, in his eyes, for Kane seemed obliged to unburden himself.

"The circumstances are extraordinary or I wouldn't bother to explain, nor would you deserve an explanation any more than the miners, plaguing me with their snide remarks.

"It was Mary who became interested in me first. Not the other way around. All the Whistler women seemed attractive to me. Just like they attracted you tonight, right?"

Longine didn't say anything. Kane smiled.

"Right!" he said. "I felt extremely flattered, just as you would feel. I'm still not sure what it was that attracted Mary, what I am in her mind. Perhaps only an intelligent pet. It's not a sexual thing. I gather you already know that much about the Whistlers. The ancient Greeks were said in myths to have had sexual relations with their gods—that's what the Whistlers are to me, in a way.

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But for humans, sex with Whistlers isn't possible, and with Mary, absolutely unthinkable even if it were physically possible. When you get to know the Whistlers, you know only that you know very little. They are an inscrutable, inexplicable bunch.

"And now we apparently have some new and inexplicable business to take care of, Mr. Longine. Your old business with the missing ponies seems to have been settled by my delaying tactics. Tonight's adventure casts everything in a different light. You did recognize that Pete and his brother carried away the main attraction by a series of Hartsfeld jumps, didn't you?"

"I suppose only Uhrquon would have missed that," Longine replied. He was thinking of how he had been asked to explain the pony express the night before, and how little of that seemed to register with the RUO.

"I love the Whistlers deeply," Kane said, "yet I feel as though I will never know them as I think I know other humans.

"And now, tonight, how do I *feel . . . after that disturbing funeral*? That could very well have frightened someone who had never met the Whistlers. It left me more than a little apprehensive—not so much for myself as for the Union, for the human race. Surely you must feel a little of that, Mr. Longine."

"I don't have your familiarity with them," Longine said. "They flat out scare me. And I didn't need them jumping off into hyperspace to convince me. The telepathy did that earlier in the evening—another little eerie characteristic you conveniently overlooked when submitting your piece for the *Guide*."

"Huh?" Kane looked puzzled, and then he smiled. "I ought to let that stand—the eternal human quest for extrasensory perception—a little sauce on the already rich revision you're framing for the *Guide*." The smile turned to a frown as he said that. "I guess that's inevitable now, what with the jumping and all. But they're not telepathic."

"If that's not telepathy it's a damn good imitation. They don't just whistle at one another like Uhrquon thinks. That expresses their feelings perhaps—it does do that—but they don't pass complex information that way. I watched them carefully tonight: the looks they exchanged, the sudden humorous whistling for no apparent reason. That didn't escape me, Mr. Kane."

"But the ultrasound did, Mr. Longine. They communicate ultrasonically—and with the same rich variety of tones and harmonics that we use in our song and speech. They're nearly tone deaf in the sonic range, like a lot of humans, merely more so. They have trouble understanding human speech. which gives people like Uhrquon the impression that they're slow —chimpanzoid. That was a natural thing to put in the *Guide*."

They both fell silent for a moment. Longine was reflecting back on the evening. That could explain it. He reluctantly discarded his evening's analytical results—the idea of mental telepathy died hard. But another question remained.

"How do you get them to work in the mines," Longine asked. "They're

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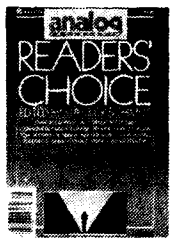

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obviously our mental equals, at least in some ways?"

"Our superiors, Mr. Longine, in all ways. Yet they insist on working for us. If you recall, Jesus Christ bathed the feet of his disciples. But with the Whistlers, it's more than just a desire to demonstrate humility. I get the feeling we're an embarrassment to them. As though they're somehow responsible for our avarice, or at least embarrassed that a fellow species could covet wealth with such intensity. I think they're subtly trying to tell us something but can't quite bring it off because of their inherent inscrutable nature."

That explanation didn't relieve Longine. It just made him feel even more uneasy.

"I've had to act the diplomat now and then," Longine said, "for UC sometimes as well as UT&E. But I'm no xenodipo from Exobiology, and neither are you. I'd say the boys from BOE are the main artillery now, and we need them here. You're not dealing with a bunch of aborigines anymore. Surely you recognize that."

"I never have thought of them as aborigines," Kane said. "Only someone as insensitive as Albert Uhrquon could think that."

"I think you've outfoxed yourself, Mr. Kane. In this situation, Uhrquon is without doubt the absolute worst possible resident union officer."

"Perhaps," Kane said, frowning. "For now, let's just go to bed. I'm sure you must be as tired as I am."

They were about to start up the stairs when the holophone rang in Kane's office. From where he was standing on the first step, Longine could see the blank stage—Kane had an ultraexpensive, fully 3-D holophone, not the navy's cheap 2-D version, which was merely a view-plate with depth effect. He could hear Kane's end of the conversation as he spoke into the handset.

Kane was looking directly at Longine when he winked, and flipped a switch. The unmistakable soprano of the little RUO came from the conference speaker.

"I've been trying to track him down since nine o'clock this morning," Uhrquon said.

"You're in luck, Albert. You've found him," Kane said. "You're on conference, and he's standing right here."

"Longine?" Uhrquon said.

"I'm right here, sir," Longine responded.

"Your damn system isn't working again. Chaplonsky says the last traffic was the four o'clock burst yesterday afternoon. God knows how long your damn pony's been missing. Chaplonsky couldn't get the damn thing to handshake when he tried to pony out a message about nine this morning."

"I'll get right on it, sir," Longine said. "First thing in the morning."

"Hell, it's already been out almost two days. Tell your people on UC to get a replacement out here now, tonight."

"I can hardly do that, sir," Longine said, "without a pony to relay the message. I expect a replacement will be on station by the time you get up in the morning."

Uhrquon hung up.

"It seems I located that one before I knew it was missing," Longine said.

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He hoped it was still sitting at the top of the centerpiece at Government House.

Kane gave him a wry smile, and they went up to bed.

6.

"Condition Six—If respect for the alien species is impossible, whereas trust is possible but not yet established, register the number six, otherwise ESCAPE to next query."

From algorithm: "Describing Alien Culture Contact," Handholder Seven, Bureau of Exobiology

They were still sitting at breakfast when Mary got up and started clearing the table.

"Just this once, Mary, let Bido clear away the dishes."

Kane spoke the words slowly and distinctly. The day before, Longine had thought Kane's odd delivery had sprung from some feeling of interspecies respect. Although that certainly was present, he now knew with his new insight the essential physical reason for Kane's deliberate enunciation: the Whistlers's tone deafness in the sonic range.

"Before Mr. Longine returns to Union Capital, he wants to ask you some questions about Whistler society and government. But before he does, I've got a couple of quick questions about the funeral last night, about your house pets. That was a stupid name I hung on them: caskets. Why didn't you correct me, Mary?"

Her hand signs were rapid. Kane interpreted for Longine's benefit, to include him in the conversation:

"One name is as good as another, but a better translation would be *sister bug* or just *bug* for short." Then, looking at Bido as he cleared the dishes from the table, she added, "Or *brother bug* in Bido's case."

As he translated her signs, Kane remembered she had called them bugs while they were developing the sign language. But then he had started calling them caskets after that first funeral, a weak but grisly stab at ironic humor, and she hadn't objected.

"Why didn't Pete suffocate —drown—when he got down in that green juice last night?" Kane said.

"Why don't you suffocate when you're closed up in your spaceship?"

"The ship provides air for us to breathe, life support."

"So do our bugs. We use the juice, as you call it, for respiration just as we do when we first break egg: to obtain oxygen and nutrients, and to carry away the waste gases we exhale and other waste products."

"Egg? Mary was that the sign for egg?"

"Yes," she signaled. "We were born of egg, sister bug and I."

"But I didn't understand, Mary. You are born in your bug?"

"Yes."

"Those were not just bugs in the cave. Those were Whistlers in bugs in chrysalides?"

"Yes. We are separated from bug—born as Whistler—as the two of us emerge from our chrysalis."

That explained a lot of things in a not very satisfactory way, to Kane's mind. But in answer to his question regarding suffocation, they had to have both lungs and gills, he concluded. And the green coloration in the juice must come from

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chlorophyll. Light passing through the beast's transparent chitinous hide must support photosynthesis in the cells of the green juice, removing the carbon dioxide and water exhaled by the Whistler by reacting then to form carbohydrates—nutrients—and liberating oxygen for the Whistler and bug to breathe in the process.

What she was telling him was incredible. No, not incredible, but ever so alien. He struggled to take it all in, but knew he must be missing a great deal.

"Inside there, how do you control the bug without being able to see?"

"We become one, it is no longer just a bug, I am no longer just a Whistler. We have become a *jumper* once again. A creature that transcends our separate planetary selves."

"I don't understand. You're just floating there in the juice, blind, cut off from everything. Are you claiming you're linked telepathically with the bug?"

"No. We're neurally linked. Our bug's sockets grab our plugs,"—she grasped her long dangling ear lobes, one in each hand—"and shift them around until they're aligned. That's a moment of extreme vertigo, nausea, for me. Weird images shift rapidly before my eyes accompanied by terrible shrieks and wails. It's so uncomfortable—that and the initial separation—some of us can never be weaned away from our bugs. Those unfortunates remain jumpers all their lives."

"That seems to me a superior, more desirable state. In fact, you yourself used the sign 'transcend' to describe a jumper."

"True. But jump durability—the protection from the harsh environment of outer space—is gained at a great sacrifice in personal sensitivity to our surroundings: in touch, and taste, and smell, and hearing, and most of all in vision, in our sensitivity to color."

It began to make some sense to Kane, an uneasy, alien sort of sense, yet still beautiful, framed by his love for the Whistlers, and for Mary most of all. The image of brilliantly colored butterflies mating on the wing came immediately to mind; only to be analyzed on the spot and corrected to a sort of mirror image: insensitive larvae winging through space; beautiful, sensitive, wingless butterflies mating on the ground.

Mary seemed now so much more than just an intimate link with another culture. She seemed to be someone he didn't really know at all. The long dangling ear lobes had just seemed to be one of those minor differences which he tried always to minimize. Those ear lobes were now a measure of the gulf that lay like a yawning abyss between them.

Kane looked at Longine. The troubleshooter looked as bewildered as Kane felt.

"I've got no more questions at the moment, Mr. Longine. I'm sure Mary will be glad to answer any further questions you may have."

Longine hesitated, trying to gather his thoughts together after being hit with so much alien biology. Then, with an unintentionally comic exaggeration of the deliberate delivery Kane had used, he began his interrogation.

"Who is the official spokesman for the Whistlers on Polyhymnia?"

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Now Mary directed a brief flurry of hand motions in Longine's direction.

"Anyone and everyone," Kane translated, and then added, "I could have told you that, Mr. Longine."

"You can probably answer all these questions, Mr. Kane. But it's important to me that I get the answers as directly as possible from an official Whistler spokesman without your unconscious bias—except for that unavoidably embedded in the act of interpretation."

"Are you saying that anyone can officially represent your government on Polyhymnia?" Longine said to Mary.

"We have no organization like your Union of Cygnus," Mary replied.

"You're saying that the Union serves that function for your people?"

"No. There is no need for such organization when all people understand and habitually practice what is best for them and best for all. Those two are the same, you see."

Longine thought that was rather naive, but could see himself getting involved in an interminable philosophic discussion, diverted from his primary intent, for he fancied himself to be initiating diplomatic relations.

He tried to get back on track.

"Not everyone can act as spokesman for the Union," he said. "Do you understand that?"

"Yes," she signaled. Even Longine had acquired an understanding of that sign. Kane confirmed his interpretation.

"In that respect, neither Mr. Kane nor I can act as spokesman. I am a data analyzer and gatherer. He could best be described as a Whistler advocate."

Mary looked at Wendall Kane and smiled, then turned back to Longine.

"I understand," she signaled. "Albert Uhrquon, the resident union officer, is the official Union spokesman."

Longine had not taken the time to foresee that logical extrapolation. He hesitated for just a fraction of a second, but in this more or less formal atmosphere that he himself had unavoidably created, he knew her statement required confirmation.

"Yes," he said.

Mary smiled.

"We feel Mr. Uhrquon is a fine spokesman," she signaled, and Kane interpreting, smiled himself. And added on his own, "I should have warned you, Mr. Longine. Mary may at times seem telepathically sensitive to your feelings."

Longine did not smile. He failed to see any humor in her unsettling ability to read him, her conclusion from his hesitation that Uhrquon would not have been his choice of spokesman. He did pride himself on his diplomatic prowess which should, in this situation, have included a poker face.

Before Longine could respond with his next question, Mary added, "Mr. Uhrquon has had a long period of service with the Bureau of Exobiology."

Longine looked at Kane, quizzically.

"We talk to one another a great deal," Kane said. "For your information, though, I have not mentioned the matter of the missing pony. Until last night, it did not seem to concern the Whistlers, and now it no longer seems to involve me. Except to protect their interests."

Kane added the last phrase, more slowly and deliberately.

"Mary," Longine said, "did Whis-

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tlers remove from Polyhymnia orbit a small Union vehicle, placing it on the desk of Mr. Kane, and some time later, remove a second Union vehicle from orbit, placing it in the centerpiece on the dining table of the resident union officer?''

''Yes,'' she signaled.

''What was the motive for that piracy?''

Now Mary looked quizzically at Kane.

''An act of robbery, stealing, we also call it hijacking,'' Kane explained.

''Diplomacy,'' Mary signaled. ''A first overture in the establishment of interspecies understanding and cooperation.''

''Piracy seems an unlikely first tool to employ; hardly something to engender trust.''

''Trust is one of two legs upon which to build a sound interspecies relationship. Respect is the other. Only our acts can command respect. Only our advocates,'' and she looked at Wendall Kane, ''can create trust. The last requires a long slow process. We have given ourselves five years as the first step in that effort.''

She waited until Kane had finished with his interpretation, and then added:

''On the other hand, respect can be achieved almost instantaneously if the demand is properly executed. We have an old saying to the effect that one must first get the other party's attention. Have we succeeded in that respect, Mr. Longine?''

Now Harvey Longine was forced to smile. It was the diplomatic thing to do.

''Yes,'' he said.

* * *

7.

''Condition Seven—If neither respect nor trust can ever possibly exist between the Union of Cygnus and the alien species, register the number seven.''

From algorithm: ''Describing Alien Culture Contact,'' Handholder Seven, Bureau of Exobiology

At Wendall Kane's request Albert Uhrquon, with a puzzled look on his face, led Kane and Harvey Longine into the dining room of Government House. Longine plucked the dull black ball from the centerpiece, explored the surface with his fingertips, and heaved a sigh of relief when he found the UT&E logo.

He turned then to the RUO and said, ''This is a UT&E pony, the last one that was taken from orbit, as a matter of fact. That hijacking occurred only a short time before we had dinner night before last. And all the time that pony was sitting right here in the centerpiece. I rolled it around on the table, if you remember.''

''Damn,'' Uhrquon said. ''Why didn't you say so then?''

''It looked like you might very well be the culprit. That's what I was trying to establish that evening. Whether it was you or perhaps Chaplonsky.''

''Or Kane or one of the other miners,'' Uhrquon said. ''So who is it? Union Bell, like I suggested in the first place? You've obviously found out or you wouldn't be back here.''

''It's the Whistlers.''

''Come on, Longine. Barbary pirates? Interplanetary aborigines? I hardly think so.''

The accuracy of his guess startled Longine. Aborigines need not be primitive, although that was the common

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connotation of the word, but the idea that neither did they need to be confined to the surface of the planet was unusual, to say the least, and in this case, extraordinarily appropriate.

"I must commend you on your perspicacity, Resident," Longine said. "I had not thought of them in exactly that light; but yes, interplanetary aborigines, that's exactly what they are, as near as Mr. Kane and I can determine. And mind you, he's been at it for five years."

"We got some new data last night, Albert," Kane interjected. He looked at Longine, Longine nodded, and he continued. "We attended a Whistler funeral last night, the father of my foreman Pete. We had just got home from that affair when you called.

"Remember that other funeral I told you about? How they use those monstrous bugs as coffins?"

"As I recall, by your own testimony, Wendall, you were drunk at the time. Since I've never seen the monster bugs you talked about, I attached absolutely no credence to your account."

"You've never been in a Whistler home then," Kane said, "never taken a close look at the mobile furniture sitting around here and there?"

"No, the interior decor of a Whistler home holds little fascination for me. I've never been inside one."

"Well, Albert, for your information, Mr. Longine was with me last night and neither of us was drunk." Then Kane described in some detail the funeral they had witnessed.

He concluded, "That was as remarkable a symbiosis of two alien species as either of us has ever seen. At least they appeared to be two different species. I have trouble thinking otherwise. Both Pete and his brother melded with those beasts, a natural organic union that merged the Whistler's brain and goals —the software—with the hard chitinous durability of an insect—the hardware—to form a creature whose natural habitat is the vastness of space itself, and whose equally natural method of locomotion seems to derive from what we would call Hartsfeld jump technology. This could turn into a real putdown for the Union, Albert, but somehow we're going to have to cope with it."

Albert Uhrquon didn't say anything immediately, but his eyes were sparkling and his screwed up little face, with that huge nose jutting so prominently before him, slowly formed itself into a broad grin.

Finally he slapped his knee and said, "By god, we've arrived, Wendall. I thought it would take longer. And I had no idea, not the faintest suspicion, that the Whistlers were involved with the pony hijackings. It all makes such beautiful sense now. I doubt if you know what I'm talking about so let me explain something.

"Five years ago, when you brought me out here on that appraisal visit, I had no intention of taking a resident's post on this god-forsaken planet. I came only because you insisted, and because you were a fraternity brother and the closest thing to a real friend I had ever had in college, or anywhere else, for that matter, before or since. It seemed like the least I could do was look the place over.

"But that week I spent with you on the island, while you were building the house, convinced me that, with the

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Whistlers, you were likely more involved in real xenobiology than anybody in BOE anywhere in the galaxy. This was where the Bureau's exobiology was really happening. And though you may not have intended to, you were letting me in on the ground floor, giving me a chance at the biggest xenology coup in history, the only game in town, really, and a chance to even the score with all those pompous bastards in the Bureau.

"It's been difficult living with what I finally realized was your actual assessment of me, but it's been worth it. I hated not inviting you to Government House more regularly, but that time you brought Mary—and particularly that week on the island before that—made me realize I had to avoid her, if she was not to blow my cover before things on Polyhymnia ripened and matured to as favorable a first contact condition as possible.

"We started at condition four and here we are at condition two, already. Of course, I had no idea the Whistlers were an interplanetary species. You're really something, Wendall. I couldn't have found a better xenologist if I'd gone out beating the bushes."

Wendall Kane was now the one who was surprised, and from the scowl on his face, just a little miffed at being called a xenologist.

"You're the goddamn xenologist, Uhrquon. You're no better than a spy, and a sneaky one, at that."

"That's right, Wendall. Spies are unavoidably sneaky," Uhrquon said with a grin, now faint enough so it wouldn't appear he was rubbing it in.

"So what the hell are these 'contact conditions?' " Kane asked.

"Almost a century ago Lorimar—John Lorimar from Borgohn B—showed with Boolean logic that there are only seven possible contact conditions, and only one more favorable than ours. Condition two can be described in very simple terms as an overt demand for respect by the alien species coupled with previous establishment of familiarity with and trust of the alien species by one or more responsible Union citizens, rank five or higher, in this case Wendall Kane; and I could include Albert Uhrquon except that the assessing BOE officer must disallow himself.

"Condition one, where respect and trust are both universally established at the outset—by the inherent nature of the first contact—is understandably pretty unlikely to occur."

Uhrquon turned to look directly at Harvey Longine.

"I guess I've blown my cover, Mr. Longine. My apologies for the other night. But it's damn high time, if I do say so myself."

Harvey Longine had never heard of "blowing cover" and put it down as another of the anachronistic phrases the little RUO doted on. He knew that if ever he should have been irritated by the pompous bureaucrats in the government of the Union of Cygnus, he should have been outraged by Albert Uhrquon. The ugly little RUO probably knew all about electromagnetic radiation and Hartsfeld signal degradation, and had probably been laughing at Longine all through that dinner, disdaining his news, pulling his leg, and all the while the pompous little bureaucrat had not known

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he had a pony right in the middle of his table. Longine was sure of that.

He knew he should be outraged and he felt like he should be outraged. He had every right to be outraged. But he wasn't.

All he felt was relief and the sense of being completely drained. He had dreaded this confrontation with Uhrquon, and the worry that he might never convince either UT&E or the government of the frightening situation he felt for all humankind. Mary had already made clear his limitations as a diplomat.

And Albert Uhrquon had just relieved him of that disagreeable and frightening task—of interspecies intermediary. There was little room for rage in the midst of all that relief.

Now he could go back to trouble-shooting the simple problems posed by UT&E operations. That error in the *Guide For Astronauts And Pilots* still bothered him. He would have to do something about that. Otherwise, with its pony back in geosynchronous orbit, Polyhymnia was Uhrquon's baby. ■

NIGHT OF FALLEN LIGHT

K.C. Warren

We of the Fire Clan were first to see it,
the wingless bird above the sacred hill.
We stood silent
and some were afraid
but I among all knew it was dying;
like a flame it blew before the sky's lights
only to descend in smoke.

We climbed the sacred hill
and gathered 'round the fallen bird
to watch its burning eyes close,
to sing strange songs in words we did not know.

We feasted that night of fallen light
and were much content,
though I thought later
we should not have loosed our arrows
on the beasts that walked
from the bird's belly.
They looked so much like us.

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Stephen L. Gillett, Ph.D.

THE GOVERNMENT, THE FRONTIER, AND SPACE

If reality looks discouraging, a small dose of historical perspective may be in order.

Q: What country currently has a permanently staffed space station?
A: The USSR.

But the USSR doesn't believe in free markets! Well . . . it doesn't matter what they believe in, they've got the station.

Among many people, it's now an article of faith that private enterprise could develop space faster'n'better if the damn government would just get out of the way—especially since the *Challenger* disaster. And fiction authors from Robert A. Heinlein to Charles Sheffield have postulated go-get-'em industrialists who have single-handedly yanked humanity into the space age—generally in the teeth of venal government opposition, and making a huge pile of money in the process.

Yet, is this realistic? G. Harry Stine and Wilfred C. Smith had a refreshing article in a recent *Analog* (Feb. 1988), in which they noted the major constraints under which a private enterprise works. In particular, payoff scales must be *short*—typically no more than five years—and risks must be known, or at least believed to be known. Furthermore, the higher the perceived risk, the smaller the amount of up-front capital available, and the higher (and sooner) the payoff required. People invest to make *money*. They may spend a great deal of money on things they believe in, or that interest them; but those aren't investments.

More on that element of risk: you'll note I said "known" risk. Generations of engineers and visionaries have doodled wondrous widgetry on napkins and envelopes, only to be disappointed because no one antes up to build their

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brainchildren. Such people are blithely ignorant of the extraordinary risk in scaling neat ideas from the drawing board to the lab, much less from the lab to the real world. New technology has far more bugs, and takes *far* longer to develop, than one really expects—even if he realizes that it will take longer than he thinks!

And this is true even if the demand for the product or service from the new technology is known. If the product itself is an unknown (as, for example, with whatever can be made cheaply with microgravity processes), the risk has an even more profound element; not only do you not know how much it will cost you to develop your technology, you don't know if anyone wants its products anyway!

Make no mistake about the magnitude of this latter risk: for the past several years, yours truly has been working at taking geophysical techniques out of the lab, where they have well-known but academic applications, and convincing industry that they can solve real-world problems. Here we *have* no technology development; no marvelous black boxes to be built, no artist's conceptions to be turned (painfully) into reality; and here we *do* have known applications. Yet still the sales job has been monumental. Businesspeople are conservative. They have to be; they know that money is hard to come by, and that most new ideas don't work.

A historical note helps illustrate these points. An engineer named Robert Brewster Stanton surveyed a railway route through the Grand Canyon in the 1880s, and despite losing a number of his party to drowning, remained enthusiastic about its potential. He never got financial backing, however; by the late 1880s there was simply no demand for a new railroad, especially one with the expensive right of way needed through such rugged terrain. The project would undeniably have been "technically sweet" (although its esthetics could be criticized), but financially it made no sense.

(Surprisingly, a few go-get-'em, eccentric industrialists *have* existed. Perhaps the best example is Henry Flagler, who had made a fortune with Standard Oil as one of J. D. Rockefeller's lieutenants, and who, upon moving to Florida in the 1880s, evolved a quixotic quest to run a railroad the length of the state—culminating in the dedication of a line from Miami to Key West when Flagler was 82. Flagler almost singlehandedly created south Florida's tourist and retirement industry. And although he *did* get a return on his investments, it was not as great as he could have gotten elsewhere. But it's hazardous to wait for a Henry Flagler to appear, especially when the rest of the world is not waiting.)

So, in this article I want to look at historical parallels for major developments. I am interested in what *has* worked historically, not in what "should" work, or what "ought" to be done; what Robert J. Ringer calls the "Theory of Reality": how it *is*, not how it oughta be. Thus, I will pay no heed to the party theoreticians of various flavors who are convinced of how things

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should be done. I am also not going to belabor the rights and/or wrongs of NASA vs. various entrepreneurial start-ups vs. the Dept. of Commerce vs. whoever. (One of the things we'll also find in our survey is that shrill battles over turf between all permutations of government agencies and/or private entities is nothing new and nothing cosmic. Thus one can contemplate somewhat more serenely the current chaos in the U.S. space effort.)

So, let's look at history:

(1) Is there any historical basis for a government role in pioneering development? If so, what form did it take?

(2) Alternatively, is there any historical support for private enterprise furnishing the *primary* motive for exploration and development in a frontier?

"[I] erected a mark, and took possession of the coast on behalf of the Hudson's Bay Company."
—Samuel Hearne, at Coronation Gulf on the Arctic, 1771 (quoted in Newman, 1985, p. 355).

To address the second question first; a very qualified yes, almost a no. In the late 17th and 18th centuries, a number of western European governments chartered private companies to explore and trade with the Americas and the Far East, but because of the high risks involved, such entities demanded (and got) monopolistic protection, and either became arms of their respective governments, or else acted as *de facto* sovereign entities themselves.

For example, the Dutch East India Company held a chartered monopoly on far Eastern trade, to be sure, but by the terms of that charter was also specifically to exercise sovereignty on behalf of the Dutch government (e.g., Van Vlekke, 1946).

The Hudson's Bay Co. was chartered by King Charles II of England in 1670 as a fur-trading monopoly centered on Hudson's Bay. But although the charter granted an enormous and (as it worked out) lucrative monopoly over a major part of North America, it was virtually a delegation of sovereignty. Performance standards of the charter were almost non-existent; a purely symbolic (and seldom enforced) payment to the Crown was included, plus some vague mandates to explore interior North America and to seek the north-west passage. Despite occasional pressure, however, little exploration was done; for fur trade was too profitable. (And in one bizarre incident, a Hudson's Bay Company trading post fired on Royal Navy vessels—which *were* seeking the north-west passage—in 1741!) Only when the fur trade thinned out around Hudson's Bay was the Hudson's Bay Company pressured to venture farther afield; and then its quasi-sovereign nature was underscored by Samuel Hearne's planting the Company's (!) flag on the shores of the Arctic in 1771.

And despite these belated efforts, the Hudson's Bay Company eventually held up development of British North America. The U.S. managed to nip off the southern half of the Oregon Country, nominally under the Company's mandate, in 1848, and the British govern-

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ment feared—probably correctly—that if the lands under nominal British control between British Columbia and Ontario were not settled quickly they, too, would be taken over by the Americans. This fear was a major motivation for creating the Canadian confederation in 1867; and creating Canada involved paying off the Hudson's Bay Company to buy out King Charles's antique charter.

So, there is a precedent for chartered, guaranteed monopolies opening up high-risk development. But such entities are quasi-governmental themselves, and despite the paeans to the free market, they don't necessarily lead to optimum or expeditious development in a competitive world.

EXPLORATION AND TRANSPORTATION

"What do we want of this vast, worthless area . . . To what use could we ever hope to put these great deserts or these great mountain ranges . . . What can we ever hope to do with the western coast, a coast of three thousand miles, rock-bound, cheerless and uninviting . . ."

—Senator Daniel Webster of Massachusetts, speaking on the American West

To turn back to the first question, let's confine ourselves to examples from U.S. history. In this way we need to worry less about different cultural biases—after all, the U.S. has had an ethos of free enterprise, and an aversion to government control, since the Revolution.

Exploration and its follow-ons have at least two pragmatic purposes, besides the atavistic or romantic one of "see what's over the next hill":

(1) Establishment of sovereignty, which is necessary to establish legal protection for activities; and

(2) Reconnaissance for development: Is anything valuable? If so, what? And how could it be exploited?

Eventually, these lead to:

(3) Building the basic infrastructure for development.

Most Americans would agree the first purpose is a proper function of government. Many would say the second is also. But most, probably, would say the third purpose is *not* a proper governmental role, and we like to think that the U.S. government's role in the settling of the west was limited to the first two.

It wasn't.

THE TRANSCONTINENTAL RAILROAD

"The Pacific Railroad is too big for private enterprise . . . The Government should build it . . ."

—Grenville Dodge, later chief engineer for the Union Pacific Railroad, 1863 (quoted in Howard, 1962, p. 152)

A transcontinental railroad was first seriously proposed in the 1840s, when railroads were still little more than dangerous toys. A federal role was justified by the already well-established government subsidy, via land grants, of "internal improvements" such as canals and turnpikes. By 1850 Congress had granted about 7,000,000 acres from the public domain to such projects (Stover,

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1970, p. 58).

However, the railroad was delayed for almost 20 years for political reasons. By the early 1850s, several routes had been surveyed, and James Gadsden, later minister to Mexico, tallied estimates of their costs (which ranged from $70 to $170 million!) in a report to Congress in 1853. (Remember how much bigger 1853 dollars were; these values, in 1988 dollars, are on the order of the estimates of the cost of the NASA space station.)

(The southern route came in cheapest, at $70,000,000, but this was widely suspected to be a politically flavored estimate by southerner Gadsden. Nonetheless, the Gadsden Purchase from Mexico (1853), of what is now southern Arizona and New Mexico, was motivated by this route. Track was not actually laid this way for almost 30 years (!); it was completed by junction of the Southern Pacific and the Texas and Pacific in 1882.)

Anyway, quite apart from quibbles as to the accuracy of the costs, states were not willing to support a route that did not directly benefit them, so congressional support foundered. For example, the Niles bill of 1848 provided for a railroad that would have gone to Chicago, so Benton of Missouri couldn't support it. Then Benton, in turn, introduced legislation for the "Buffalo Road" route (the route eventually followed by the Union Pacific) and it never got out of committee[1] (Howard, 1962, p. 55).

The Pacific Railroad Act was finally passed on July 1, 1862, partly because the southerners were absent due to the Civil War. (This also ensured that the first transcontinental route would be northern, not through the Gadsden Purchase.) Why such legislation during the Union's darkest hours? Partly as a morale builder, but mostly to keep California (already a state for ten years) committed to the Union cause. Lincoln and his advisers feared a Balkanization of the U.S., with California also seceding if the Confederacy's successes persisted. (And despite the national crisis, fervent politicking for the advantage of the eastern railhead began immediately! Construction of the Union Pacific from Omaha actually began during the war.[2])

The Act granted "vacant lands within ten miles on either side of the lines for five alternate sections (one square mile parcels) per mile." A system of federal loans to the contractors, based on trackage laid and repayable at 6% over 30 years, was also established. Finally, the Act also specified that all materials must be made in the U.S.[3] (Howard, 1962).

Heavy subsidy with land grants became the norm for western railroads. Six sections per mile had been a typical subsidy during the 1850s, and after the Civil War, grants were typically more generous; the Northern Pacific finagled 40 sections per mile—and in forested areas, received also the additional value

[1] And you thought the SSC squabbling was new!

[2] Ironically, most military protection along the route was provided by "Galvanized Yanks"—captured Confederate soldiers offered the choice of a prison camp or fighting Indians in Nebraska Territory.

[3] Surely you didn't think *that* was a new line, either!

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of the standing timber! All in all, in the 21 years from 1850-1871, a net total of 131,350,534 acres of Federal land were given to the railroads (Stover, 1970).

Even at 19th-century land prices, that's a piece of change . . . remembering again that dollars were lots bigger in the 1800s. (For example, the UP in the 1870s sold Nebraska farmland at $3-$5/acre.) And of course, the present-day value of this land is astronomical, even allowing for inflation. (Check out a present land ownership map along the rights-of-way; to this day it forms a checkerboard, from the alternating sections of the railroad land grants.)

Of course, this is the most painless kind of subsidy; just liquidate assets without spending taxpayers' money. But it is a handsome subsidy nonetheless. The method is still popular, though it becomes less effective as assets become fewer. Those who bewail current government expenditures, in contrast with the past, should remember that it was easy to hide government subsidies when you had so much capital to give away.

Some depressing effects also ensued from the political push to build the railway. Controversies over specifications of grade and route were manufactured to be used as weapons in political infighting; i.e., technical pettifoggery was used to cloud political issues.[4] And Credit Mobilier, the holding company for the Union Pacific, collapsed in the 1870s amid a cloud of scandal; its directors, convinced that the railroad would never pay, had devoted their efforts to financial machinations to milk the federal treasury while it was possible. (By contrast, their counterparts on the Central Pacific, building east from California, later used their foothold in railroading to build a highly profitable railroad network, the Southern Pacific.) But finally, amid scandal and waste, the transcontinental railroad was completed in 1869, with the driving of the golden spike at Promontory Point, Utah.

In summary, the Pacific Railroad was an extremely capital-intensive, pioneering venture that involved rapid interstate transport and western settlement—both then matters of urgent national concern. And although the sovereignty of the U.S. over the western lands could not be seriously contested after the Civil War, there is no question that the Pacific railroads expedited settlement and development of the west by decades—and may indeed have helped keep the Union together.

DAMS, IRRIGATION, AND HYDROPOWER

"[before 1904] . . . there had been a great number of private irrigation projects . . . and with few exceptions they had been superbly engineered. But they were financially unsuccessful because the construction and engineering costs were too great . . ."

—Judge B.B. Horrigon, recalling in 1972 his involvement in financial reorganization of irrigation projects in the early 1900s (quoted in Oberst, 1978, p. 67).

It's been pointed out many times that

[4] Sound familiar, space fans?

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a settler in the New World had air to breathe and water to drink; minimal (although significant) additional investment was required to establish a home or make a living.

This is *not* the case in space; vastly more infrastructure is required than just the transportation. So a more useful analog to space development would be a situation where a massive infrastructure has to be established *ex nihilo* before dispersed economic activities can occur. Do we have any historical analogs for this situation? Yes—the great water and power projects of the arid West.

Beyond the 100th parallel, in the intermontane west, most land is too arid for dryland farming. Here and there, however, irrigation was possible, and small scale projects had had some success. By the close of the 1880s all small irrigation projects had been done, and larger, more capital-intensive projects became for a time trendy speculative ventures. But such projects collapsed with dreary regularity through the 1890s and early 1900s, because they were undercapitalized and did not have sufficient ongoing revenue to maintain cash flow. (So much for the free market.)

Larger irrigation projects also generated intimidating legal questions. For one thing, navigable waters came under federal jurisdiction—and the implication of national water laws, which had evolved where streams were important as transport arteries rather than for the water they contained, was that navigational uses must have priority. Locally, usage had implied (e.g., on the Colorado River by the early 1900s) that water for irrigation was more important than navigability, but before large dams or other diversion structures could be built, these priorities had to be clarified —especially with rivers crossing interstate and international boundaries.

The generation and distribution of electrical power, an obvious way to help pay for irrigation waterworks, proved another thorny issue—was the government to generate power? Or contract out the generation capability? What price was fair for power generated from public projects?

And last, water law itself proved a fruitful source of controversy. In the west, water law had diverged from common law, developed in well-watered lands. Western law could be summed up "first in time, first in right": whoever first put water to "beneficial use" gained the right to it. (Common law recognizes "riparian right"—whoever owns land along the river has rights to its water.) Thus upstream water could end up *totally* committed to downstream uses, if the downstream users were first.

This tangle of pressures—the scale of capital required, the long-term nature of waterworks, and the legal questions revolving around water usage—culminated in the Reclamation Act of 1902, which established the Reclamation Service—later (and still) the Bureau of Reclamation. This agency had a congressional mandate to build projects to reclaim the "arid lands," the cost of reclamation to be eventually repaid to the government. (In a curious sidelight, individual landholdings in most reclamation projects were—at least in the-

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ory—limited in an attempt to encourage small farmers, an echo of the Jeffersonian ideal of an agrarian nation of freeholders.[5])

Thus, by the turn of the century a federal agency charged with building and arranging for payment of massive infrastructure had appeared. Since the government had run out of cheap, good land to give away, paying for such large projects just with agriculture was a problem. (The Carey Act of 1894, a stopgap measure, offered federal lands grants to states who undertook to reclaim it. It enjoyed only modest success.) So, let's look at a couple of specific examples of such megaprojects and their financing.

GRAND COULEE DAM AND THE COLUMBIA BASIN PROJECT

"[*Grand Coulee Dam is*] *a grandiose project of no more usefulness than the pyramids of Egypt.*"
—H.E. Riggs, President of American Society of Civil Engineers, 1933

In its natural state the Columbia Basin of south-central Washington state, where I live, is a rolling sagebrush plain. Dryland wheat is successfully farmed on the eastern side, but most of the central part is too dry for anything but marginal grazing. However, the Columbia River, the fourth largest river in North America, encircles this area to the north and west. Unfortunately, to the north and northwest the Columbia lies in a deep gorge. To the southwest, however, where the adjacent lands are lower, a number of private irrigation ventures were busily going broke in the late 1800s and early 1900s.

The proximity of the Columbia continued to tantalize irrigation boosters, however, and in 1919, the *Wenatchee* (Washington state) *World* carried an enthusiastic article on a gigantic proposal to dam the Columbia at the head of Grand Coulee, a large channel in the Columbia Basin left by Ice Age floods, and run water for irrigation down its ice age course. Generation of power from the dam would pay for the project. Of course, the proposal was instantly derided as lunatic nonsense. (It *costs* too much! Who's gonna buy all that power? Jackrabbits? And, anyway, a dam that big is impossible.) The shrillest objections came from the private power companies, who, although unable to finance such a project themselves, could all too easily visualize its effect on power prices and availability.

("We're going to build giant colonies in space and pay for them by beaming microwave energy to Earth for electricity . . ."—the parallel *is* striking!)

Nonetheless, partly through its sheer audacity and partly from the obvious fertility—if it could be watered—of Columbia Basin soil, the project gained adherents through the 1920s. In particular, it seized the imagination of Jim O'Sullivan, a lawyer with engineering training, who almost singlehandedly pushed and politicked for the dam through the twenties and early thirties. Would-be space activists would do well to study O'Sullivan's career (Sundborg,

[5] You *really* thought that worries about the "family farm" were new?

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1954).)

The Great Depression provided the final stimulus for Grand Coulee Dam and its associated irrigation works, with the prospect of the thousands of jobs that would be created. Construction began on the dam itself in 1935 and was accelerated as the World War II approached. And the critics who gloomily foresaw no market for the power were proven spectacularly wrong: hydropower from Grand Coulee played a major role in the U.S. war effort, both in smelting aluminum, and in the nuclear works set up at Hanford in central Washington. (Ironically, the major harm caused by Grand Coulee Dam—the destruction of the salmon run above the dam—was never seriously advanced as an objection by its opponents. It just was not a consideration at that time.)

In fact, the hydropower proved so valuable that construction of the irrigation works was postponed till after the war. Not until 1948 were the first lands watered; and not until 1952 was water diverted directly at Grand Coulee.

How does the Columbia Basin project work? The government furnishes water with dams and a network of canals. Most (typically 90%) of this infrastructure is paid for with hydropower sales; the rest comes from payments by the farmers using the water, typically over a 50 year amortization schedule. As the irrigation works are extended, drawings are held for the new lands, and the winners sign contracts with the government. Prospective landowners must meet criteria of farm experience and net worth, but otherwise the drawings are open to all. Last, landholdings are (at least nominally) limited in size to 160 acres—the old agrarian ideal of the single family farm again. (By the way, I think there are political and economic analogs here for such projects as terraforming.)

HOOVER DAM, THE ALL-AMERICAN CANAL, AND THE COLORADO RIVER AQUEDUCT

"The power developments of Boulder Muscle Shoals, Bonneville, and Grand Coulee will cost a great many hundred million dollars, and they will probably always be a liability instead of an asset. Government cannot even let water run down hill economically . . . The country has no use at all for the vast amount of power that will be produced. . . ."
—The Yakima (Washington) Republic (early 1930s)

"It (Boulder Dam) will forever stunt the growth of the Southwest."
—Lewis W. Douglas, Arizona Congressman, in debate on Swing-Johnson bill (1928).

Far to the south of the Columbia Basin, a different area beckoned boosters of irrigation at the turn of the last century: the Imperial Valley in California, a low-lying area of the Colorado River delta where deep silt promised fertile soil—if it could be watered. Since the area lies downhill from the Colorado River, the river is a natural source of irrigation water. (Indeed, much of the Imperial Valley is below sea level; geologically, it is the northernmost part of

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the Gulf of California, which has been walled off from the sea and largely filled in by the Colorado's delta.) This obvious diversion again led to a tangle of conflicting technical and legal questions that ultimately proved insoluble by any entity smaller than the federal government.

A private irrigation company was established before 1900 to divert water; alas, the easiest diversion route lay through Mexico, which introduced international complications from the start. The valley indeed proved fertile, but the irrigation system soon proved to be a nightmare. The natural flow of the Colorado varies from a trickle in summer to a torrent during the spring floods, so a diversion that furnished ample water during the summer risked major flooding in spring, when the river's flow was many times greater. In addition, the Colorado carries a heavy load of silt, which swiftly filled diversion reservoirs and continually raised the river bed, so that levees were eventually overtopped. To generate cash flow, the irrigation company also promoted new settlement in the Imperial Valley, to the point that furnishing adequate water was becoming more and more difficult.

Then, in 1905, the spring floods broke through the irrigation works, and for two years the entire flow of the Colorado poured into the Imperial Valley, creating the Salton Sea in its lowest point. The river was finally reestablished in its course in 1907 by the Southern Pacific Railroad, whose tracks were threatened by the rising water. (They also took over the irrigation company, by then in receivership; it was eventually reorganized as the Imperial Irrigation District.) For the next 25 years, an expensive stopgap system of levees and dikes marginally restrained the Colorado. Massive floods alternating with drought still occurred every few years, and irrigation remained a risky activity.

By 1920 it occurred to some people, in particular Arthur Powell Davis[6], director of the Bureau of Reclamation, that a large dam on the Colorado River would solve a lot of problems. By storing the spring floods, the dam would both control flooding and provide water to augment the summertime flow. As at Grand Coulee, hydropower generation would pay for the dam. But the legal ramifications of such a project were awesome—never mind the technical details, intimidating though they were.

Again, under western water law, whoever first puts water to "beneficial" use gains the rights to it. And already by 1920 the Imperial Valley had "put to beneficial use" more water than the Colorado carried in the summer months. Thus the Imperial Valley users could command irrigation projects upstream, in Utah, Wyoming, and Colorado, to be shut down during the summer, because the water was already allocated. Hence, the upstream states also needed a dam for lower basin storage; by storing the spring floods to guarantee Imperial Valley summertime water, it would free up water so they could pursue their own

[6] Davis was the nephew of John Wesley Powell, who first ran the Colorado through the Grand Canyon in 1869.

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projects. However, they *had* to have legal assurances of the right to the additional water before any dam was built; otherwise the lower basin states would just appropriate the water.

To further muddy the waters, Los Angeles was looking for a new source of municipal water by the mid-twenties. The proposed large dam would make it as practical to divert Colorado River water for city use as for agriculture. L.A. thus proposed building a giant aqueduct across the Mojave Desert to bring in Colorado River water. Although this brought L.A. into the picture as another interest group in favor of the dam, it was almost the kiss of death politically. In the early twenties L.A. had appropriated the water of the Owens Valley in eastern California, which had set the city against the rest of the state. Thus, other interest groups along the Colorado, especially Arizona and the Imperial Valley irrigators, were deeply suspicious of the city's intentions.

And finally, of course, the private power interests were bitterly opposed to the project, because all practical dam-building notions relied on the sale of electrical power to pay for the structure.

Resolution of the legal issues culminated, sort of, in the Colorado River Compact, a treaty among six of the seven Colorado River basin states that allocated the flow of the river. In essence the Compact abrogated western water law by divvying up the river even though it was not yet put to "beneficial use" in the upstream states. (Arizona, the seventh state, fought the compact bitterly, fearing that California would end up appropriating the entire river. In 1938 she even sent National Guard troops to the construction site of Parker Dam, where the intake of the Colorado River Aqueduct was being built. Arizona did not finally sign the Compact until 1944. In his future history, Vernor Vinge writes of "water wars" over the Colorado; he has ample historical precedent!)

The Compact also laid to rest the hoary issue of navigation vs. irrigation by recognizing irrigation—and power generation as well—as valid uses of river water.

However, the Compact merely established a legal framework within which Boulder Dam could be built. Getting the dam actually authorized remained a formidable political challenge. Boulder Dam's equivalent of Jim O'Sullivan was probably Phil Swing, a congressman from the Imperial Valley, who got himself elected to Congress in 1921 to push for the Boulder Dam. Among other things, he helped organize boosters into a Boulder Dam Association to lobby at a grassroots level. His efforts finally culminated in the passing of the Swing-Johnson bill in 1928—after truly heartbreaking vicissitudes (Moeller, 1971). (Like O'Sullivan, Swing was also an attorney. Maybe we should take space boostering away from the engineers and give it to the lawyers!)

The Swing-Johnson Bill provided for a dam in the lower basin of the Colorado that would provide at least 20 million acre feet of water storage. It would be financed by the sale of power over a 50 year timespan, payback at 4% to begin

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when power generation started. (The first generator started turning in 1936; Hoover Dam was paid for in 1986! Four percent seems small now but was a reasonable return at the time.) Such long-term financing was beyond reach of the private sector, quite apart from the legal thicket to be traversed before the dam could be built. When amortized over such a time frame, however, Hoover hydropower was competitive even in 1928.

The power was to be sold under long-term contract to private and municipal utilities, who also were to build the transmission facilities. (Of course, the hydropower became even more cost-effective in the following years, so those long-term contracts became bargains—so much for fears that hydropower was not competitive!) Finally, the bill also provided for a diversionary canal completely through U.S. territory—the All-American canal—to the Imperial Valley, to be paid for within 50 years according to Reclamation law (Bureau of Reclamation, 1948).

Construction of the dam began in 1931, and it was dedicated by FDR in 1935—over a year ahead of schedule. Boulder (now Hoover) Dam remains an impressive technical achievement, but the technical problems of its construction were dwarfed by the legal problems.

Since the dam was completed, agriculture has paid off every bit as much as the turn-of-the-century boosters predicted. The Imperial Valley, watered with the regulated Colorado River, keeps the rest of the nation in salad when winter makes green-growing-things a memory.

The power, too, proved to have ample markets. Congressman Culkin of New York to the contrary, the BuRec did not need to sell the power to "Jack Robinson Rabbit." Even at the time the initial contracts were solicited for Hoover Dam power, the applications from the four largest requesters totaled more than three times firm power. At this point, of course, Hoover Dam merely provides peaking power. (The payoff of the original power contracts in 1986 occasioned quite a scramble for the new ones, too.)

Most ironically, some big payoffs were completely unanticipated, such as the burgeoning development of the Colorado River as a major population and recreation center between Phoenix and the coast. Esthetics aside, all those bait shops, gas stations, retirement homes, and marinas depend *utterly* on those federal dams! None of this disseminated economic activity would exist without the federally financed infrastructure.

On a different note, there are depressing lessons too, such as the later assumption of major credit for Boulder Dam by lukewarm supporters such as Hoover himself, who was at best indifferent, if not hostile, through the critical time of the twenties. (So far as I know, Phil Swing, who did far more to build "Hoover" Dam than Hoover ever did, is not remembered at the dam itself by so much as a plaque.)[7]

A more disquieting lesson, perhaps, is that establishing and maintaining such

[7] Will Proxmire one day take credit for commercial space applications?

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a major infrastructure—without which major settlement and economic activity simply could not exist—seems to require a degree of ongoing authoritarian control. As Fradkin (1981, p. 17) notes, civilizations dependent on massive waterworks have always needed cohesive political and social structure to build and operate them. In a sense, such a civilization is a "water empire"; just as in ancient Mesopotamia, controlling access to water implies political control.

It is no accident that the Mormons set up one of the earliest and most successful irrigation-based cultures in the west; with the acknowledged authority of their church to impose discipline and organization, they were ideally situated to build and operate major irrigation works. Elsewhere in the west, the irrigation districts, associations of landowners set up to distribute water from federal projects, exercise somewhat less overt but equally significant influence.

This centralization of control implied by building and maintaining major infrastructure will certainly have to be confronted in any space colonization scenario. In, say, an O'Neill space settlement, where not only the water but the very air is furnished by mammoth constructs, a large degree of political centralization will be difficult to avoid.

MODEST PROPOSALS FOR SPACE DEVELOPMENT

History is not encouraging for private enterprise *alone* as the spur to major, capital-intensive pioneering development, especially when the very infrastructure that allows economic activity must be established. Government sponsorship is how things have gotten started, even right here in the U.S.

It is indeed true, however, that such sponsorship can be carried out in counterproductive ways, and history does suggest mistakes to avoid. For example:

(1) Any monopolistic charter must be limited and contain specific, testable milestones to be achieved within a certain time frame—in stark contrast, say, to the Hudson's Bay Company's perpetual charter.

(2) "Land grants" of some sort may be useful. Although the Outer Space treaty of 1967 specifically prohibits claims of sovereignty on "celestial bodies," it also provides that activities on those bodies must be carried out under government supervision. This could provide a framework wherein the U.S. could delegate, say, lunar mining rights to a consortium.

(3) Don't set up a perpetual bureaucracy that will end up generating noneconomic makework to justify its continued existence. The Bureau of Reclamation appears to have fallen into this mode; many of its recent and proposed projects have marginal economics; because one big dam on the Colorado is good does not mean 50 dams are 50 times as good. (NASA may be falling into this trap, too.) Government's role is to provide *initial*, not ongoing, investment. Only when that initial investment is so high-risk and/or large-scale that no private entity could undertake it, is a federal role justified.

(4) Guarantee a market by the government. The railroads at one time were

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vital to national security, and merited subsidy for that reason alone. Surely at least transportation into space merits similar concern on the basis of national security, and for that reason should be offered guarantees.

(5) Rather than build infrastructure for free, later to be turned over to some private entity as an outright grant, pay the structure off. The public sector can afford much longer payback scales than the private sector—as we've seen, 50 years is a typical time—but there's still a world of difference between a long amortization period and a complete giveaway. Hoover Dam was too big for private enterprise, so it was built by the government. But it *was* paid for by the power it generated. Space stations, lunar bases, and other such major infrastructure probably could be financed in a similar way. With federal deficits running so high, this may be the only way they *can* be financed.

Despite all the tired rhetoric to the contrary, history shows that government *can* spend its way to prosperity—if the spending is done properly. ■

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● He who knows only his own side of the case, knows little of that.

John Stuart Mill

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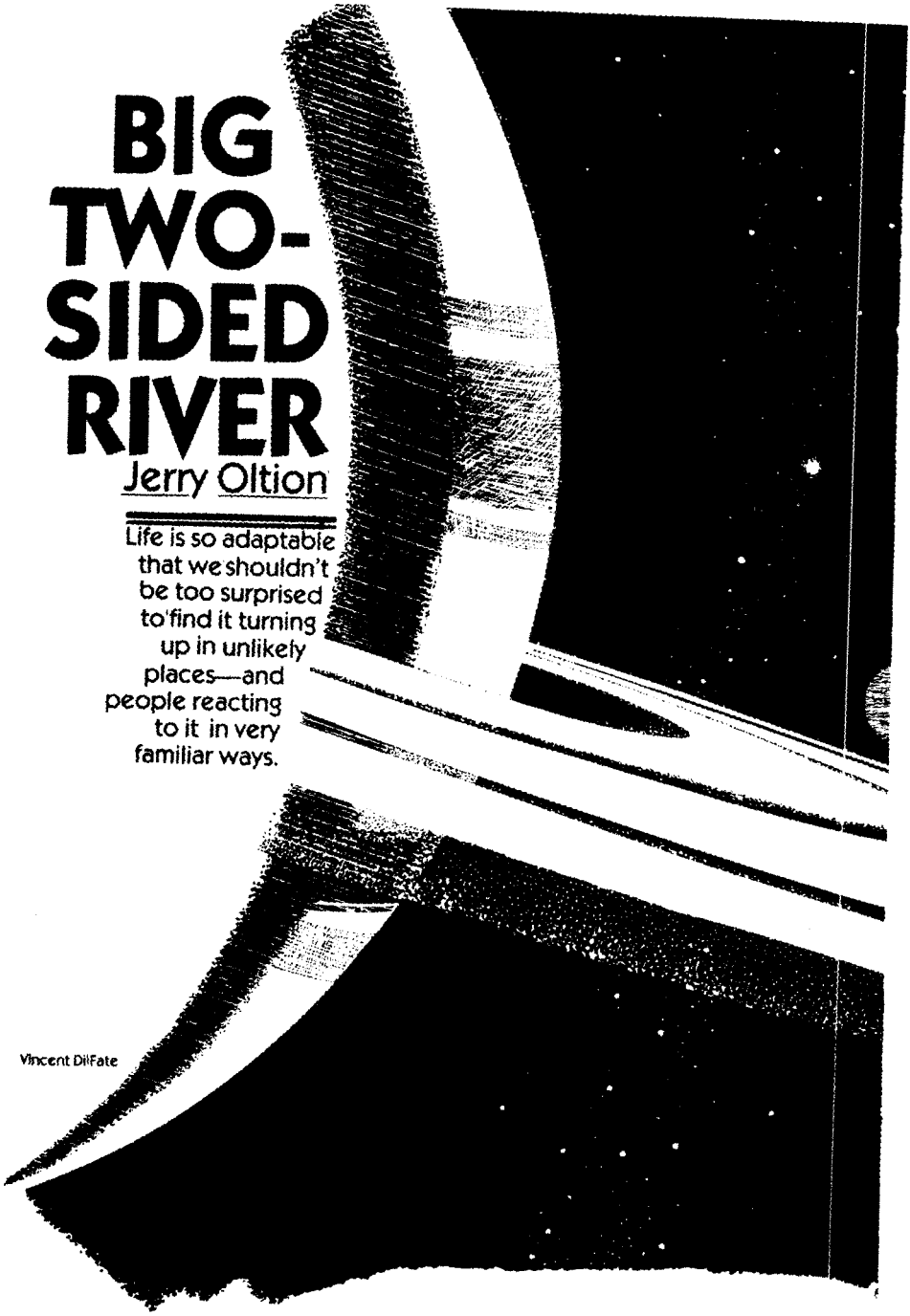
BIG TWO-SIDED RIVER

Jerry Oltion

Life is so adaptable that we shouldn't be too surprised to find it turning up in unlikely places—and people reacting to it in very familiar ways.



Vincent DiFate

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I

The ice tug dropped down into lower orbit, pulling ahead as it did until it disappeared around the curve of the planet. Jack drifted alongside the netted bundle the tug pilot had released from its clamp on the outer hull. There were no settlements here, nothing but space and the flat expanse of ring below him. The fragments of Tenner Station had long since merged with the ring. The reactor core would be a lump big enough to find with binoculars if he knew where to look, but it could be a thousand kilometers away for all he knew. Or fifty thousand. Things drifted in the rings.

Jack took his binoculars from the net bundle and looked down at the ring anyway. By naked eye, at this distance, it had a smooth texture like that of a high-speed photograph. Just a little bit grainy. With the binoculars it showed its true nature: a jumble of pebbles and rocks and boulders. Some were as big as ships. In between them, keeping station with the largest of the boulders, drifted the ring trout. They were pale gold in Saturn's reflected light. Pale gold torpedoes with long whip tentacles. The tentacles were pellet launchers for moving in space. Most of the ring's inhabitants had them. Some had hydrogen-oxygen rockets. The trout had both. Jack looked down into the ring and watched them maneuver with their pellet launchers. He watched one flick a tentacle to toss a pebble and drift in reaction into the shadow of a rock, only to toss another pebble and come to a stop there.

Deeper in the ring were the big trout. Jack tried to ignore the surface of the ring and see down into it a ways. It was hard at first, but eventually he was able to subtract the ice from his field of vision and see only the trout. They were there, twenty meters or so into the ring—a ring only a hundred meters or so thick despite its enormous breadth—lurking in the shadow of an irregular chunk of ice the size of a tug's external fuel tank.

Jack smiled inside when he saw the big trout. Research, he thought, and he laughed out loud. He lined the crosshairs in his binoculars on a big trout and triggered the message pulse. The comm laser was invisible to Jack, but the trout either saw it or felt it and launched itself away with its rocket. It moved much faster than the one that had been throwing pellets. Even startled as it was it had picked a destination before it launched, bouncing off another ice rock and killing most of its velocity without having to use its rocket again to slow down. It slipped into the shadow of another ice chunk and launched a pellet to stop.

Jack turned away to look at Saturn. It was a yellow-orange wall beside him. He gripped his oversize net bundle backpack for an anchor and twisted around until Saturn was above him, then behind him, then below. He put it back where it was, to his left side with the ring below. He was looking downstream. He liked it best that way.

Left alone, Jack and his bundle of supplies would eventually drift down into the ring plane, through it, and out the other side. That was the way orbits worked: everything had to cross the equator twice on its way around the planet, unless it was *on* the equator. The rings were the equator. Crossing through and coming to a stop on the other side

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would take about five hours; half an orbit. Jack enjoyed drifting over the ring with Saturn off to his left but he didn't want to wait that long. He put his binoculars away and pulled himself partway around his bundle until he found the straps, slipped into them and tightened them against his arms and legs. The rocket motor on the other side was pointing straight through his stomach if he had packed everything right. He took the firing control in his hand and pushed the handle slightly to the right. One of the tiny attitude nozzles fired, tipping the tied-together spaceship until Jack faced the ring flat on. He pushed the control the other way to stop his movement. He held his breath a moment, savoring the excitement rising in him before he touched the main firing button. As far as he knew, right now he was captain of the simplest piloted ship in space. The ice asteroids that he and the other miners sent on their slow journeys toward the habitats in Earth orbit didn't count. They were remotely piloted, by computer.

He pushed the button. The rocket pushed against the bundle. The bundle pushed against him. It was a light push, lighter than he had expected. His pack was too massive. Still smiling, Jack held the fire button down for another few seconds. Part of that extra mass was fuel.

When the ring began to rise visibly toward him, he let off the button and coasted. Without the binoculars the ring was a grainy photograph again. He was still too far from it to see individual particles with the naked eye, but he was too close to see the macroscopic patterns, the gaps and spokes made by tidal interaction and by the tiny moons orbiting within the rings themselves. Off to the right he could see where the plane humped up a few hundred meters in a gentle wave, possibly part of one of the braided rings but just as possibly a Periscope Heron enclave or even just the result of some mining tug's exhaust.

As he drifted closer, a flake of something drifted onto his leg and stuck. He watched it fluttering against the tight fabric of his micropore skinsuit, fluttering exactly as if it felt the breeze of his passage. It was probably attracted to the heat. Another landed on his left forearm. Jack unstrapped that arm and slowly reached down until the two creatures saw one another and tumbled off together toward the ring again. Flutterbies, they were called.

The miners had made up their own names for the life they had found so unexpectedly in the rings. Flutterbies and Ring Trout and Periscope Herons, and a hundred others, all evidently living off the coal-black Nightoplankton that slowly concentrated the sun's weak radiation into a useful form of energy. That was one theory. Nobody knew for sure if that's the way it was. When the biologists made it out from Earth they would know. Until then they only knew what miners are always quick to learn about the local fauna. Some of the creatures, properly cooked, could be eaten. Some were harder to catch than others.

The first of the ring particles drifted past. It was the size of his fist and moving about as fast as a gently-tossed rock. Below, the ring had resolved into individual particles. He had drifted close, engrossed in the flutterbies.

The sunlight was at his back. Even

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here, less than a kilometer from the ring, Jack felt that he should be able to see his shadow against it. It was that opaque. He knew that from the other side he would be able to see through it, see the sun and even some of the stars about as easily as if he were looking up through a forest canopy, but from here it looked opaque. Off in the distance it still looked grainy, but opaque there, too.

He was getting close. It was time to turn around. Jack pushed the firing control sideways and felt the tiny attitude rocket swing him around until he was facing away from the ring. He had to look to both sides and down through his feet to make sure he was pointing the right way. He pushed the control again and stopped his rotation. Another ring particle, this one as big as his head, spun past only a few meters from his feet.

He pressed the main firing button. He felt the rocket pushing against him again, slowing him now. Another ring particle drifted past. Space seemed to be getting foggy around him. It looked as if he was about to dip into a big bank of fog. That was the ring surface coming up. The ring was mostly tiny particles; dust, really; the big ones were rare by comparison. The dust stayed in the plane better, though. Dust particles didn't have enough mass to plow their way through the rest of the dust every five hours like the bigger chunks did.

Jack let up on the fire button. He was still drifting ringward, but slowly now. He twisted the control to turn sideways so he could see. He was in the ring. He watched the boundary slide past, the ring surface fuzzy and indistinct close up, but sharp as a knife edge farther away. It closed over him like a wisp of cloud. Now the sky was slightly overcast. Cirrostratus.

Jack felt a heavy bump through the pack. He had hit an ice boulder. He rebounded from it, spinning gradually from the impact. The boulder was big. It was probably ten meters across, though very irregular. It had a deep depression in one face, hollowing it almost like a drinking cup. It was probably a nest of some sort, but it looked abandoned now. It would make a good camp. The high walls would protect his bubble from more boulders except for those coming straight in, and if he gave the whole camp a gentle motion through the ring then there wouldn't be any coming straight in.

He unfastened the wire pistol from his belt and aimed at the rim of the depression. The pistol fired a dart trailing a spun diamond monofilament. Jack pulled the trigger and the recoil spun him back slightly, but the dart hit the ice and stuck and he pulled on the pistol to arrest his motion again. He pulled the trigger a second time and the reel began to wind up, pulling him and the pack in toward the ice. His suit had maneuvering rockets built into the waistband, but the wire pistol was less wasteful.

By the time he reached the surface, Jack was ready with a handhold. He stretched out with his arm and triggered it just as its tip touched the ice, and the compressed air charge inside drove the barbed spike deep into the boulder. He unfastened another handhold from his equipment belt and anchored it an arm's reach away, then slipped out of the straps holding him to his pack. He used the straps to tie the pack to one handhold and he clipped his safety line to the

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other. He worked the wire pistol's dart free from the ice and put the pistol back on his belt. Then he advanced down into the depression, pulling himself along against projecting pieces of ice until he stood in the hollow looking back up at his pack on the rim.

The surface of the ice was bumpy. Jack put in another handhold to anchor himself and chipped at the ice with his boot until it was smooth enough for the bubble floor to rest against. It didn't have to be terribly smooth, since there was no gravity to pull him against the floor when he slept, but he wanted it smoother than it had been. It wasn't a camp unless you smoothed the ground.

When he was satisfied, he pulled himself back up to his pack and removed the collapsed bubble from under the net holding everything in. His sleeping bag tried to drift out with the bubble, but he shoved it back in and tied off the net again. With the bubble out of it the netting looked much emptier. Half the mass had been the bubble.

He shook the bubble to unfold it. Half a dozen more handholds lay rolled up inside. He took them from their loops and went back down into the depression and anchored them to the walls, spacing them evenly around. He removed the handhold he had put in the very bottom and recharged its air tank from his suit. He hung that one back on his belt.

The bubble had straps tied to each of its six corners. Jack tied one to each handhold, cinching them down tight until the floor was stretched like a drum head. When the bubble was anchored he went back for the rest of his equipment and pushed it inside piece by piece through the tiny door. The clear fabric of the dome lay in folds over it all. The rocket engine stayed outside; Jack pushed it, and its fuel tank, ahead of him back out of the depression in the ice boulder and set it so that its flat base rested snugly against the ice on the side of the boulder facing back out of the ring plane. He had to guess where the boulder's center of gravity would be from that point. On the job he had an ultrasensitive gravitometer to do it for him so he could position the rocket exactly. Precision was important for the ice to make the long trip to the habitats in Earth orbit, but for this a good guess would do. He guessed that the center of gravity would be about two or three meters beneath the bubble. He aimed the rocket so that it would push toward that point and anchored it firmly to the ice with a handhold on either side. Then he pulled his way around to the other side of the boulder, the side opposite the rocket. His safety line snaked back the way he had come, still clipped to the handhold there, but he attached another one where he was and held onto it while he pushed the firing button for the engine. Better to be safe, he thought. Normally the rocketeer didn't ride the ice.

He couldn't feel the thrust, not against so massive a chunk of ice, but after twenty seconds or so he let off the firing button and looked at the other ring particles around him. If he steadied himself and watched for half a minute he could just see their relative motion. That was about right. He didn't want to drift too far, just enough to make it through the rings and a little ways out into emptier space while he slept. He wasn't sleepy yet, but he knew he would be. He'd

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been up for nineteen hours already—first working his shift and then waiting for the ice tug and then riding it out here to where old Tenner Station had been before the accident. It hadn't been difficult to hitch a ride; Tenner was still in the autopilot's route menu. The pilot had laughed at Jack's enormous pack and at his stated intention to camp in the rings, but he had taken extra care in stowing the net bag and he had stayed to talk for a few minutes before he left him there alone.

"Let me know how it goes," he had said when Jack stepped into the airlock.

Jack had smiled inside, feeling the man's wish to come along. "I will," he had replied.

The ice boulder was moving slowly toward the night side of the ring. The depression with the bubble in it wasn't at the very aft end of the travel axis, but it was aft of the equator and that was good enough. Jack pulled himself toward it again with gentle tugs on his safety line. On the rim again, he chipped off a big chunk of ice and carried it down with him to the bubble. He pushed it through the door of the bubble and followed it in, then remembered that his line was still fastened to the rim. He backed out again and ducked under one of the bubble's guy lines before he went back to unclip himself. When he unclipped himself from the handhold he clipped the line end to his waist again, the loop around the bubble line still holding him tied to the ice boulder and all his gear. He pulled himself back down to the bubble and crawled inside, then unclipped his line one last time and let the line reel draw it all back in.

The door seal took a little tugging to get closed all the way. The fabric of the bubble kept getting in the way. Jack finally stood erect with it draped over his head like a ghost costume at a Halloween party, and pulled the zipper closed that way. He rummaged through his gear until he found the air bottle and cracked the valve. Air pressure inflated the bubble fast. The fabric stretched tight with only a fiftieth of an atmosphere, but Jack let air hiss out of the bottle until he had half an atmosphere. That was plenty for breathing. He knew people who had trouble with half an atmosphere, but he had never had any problem. He could sleep well at that pressure without the smothering dreams.

He turned on the air recycler and the heater while he waited for any leaks to make themselves apparent. The tight bubble skin was nearly invisible now. Through it Jack could see the ice surrounding him and the other ring particles above the horizon of his camp. He watched them drift gently in their separate orbits around the planet while he waited for the bubble to leak if it was going to. By the time he was satisfied with it, the inside was warm enough that he could take off his helmet.

It was good to take off his helmet. He let it float free and scratched furiously at his scalp and neck and his right eyebrow. For some reason he had never been able to fathom, his right eyebrow always itched. It started itching the moment he put his helmet on and it didn't stop until he gave it a good scratching at the end of the shift. It was bearable if he didn't think about it. He didn't think about it or about the other itches that he couldn't scratch, but it was always there and scratching it at the

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end of the day was always a great pleasure. Only the right one was that way.

He peeled off the rest of his suit and shook it out like a rag. His lower body didn't have persistent itches because the suit was thin enough that he could scratch through it when he needed to. But it was still nice to be out of the suit.

Equipment floated everywhere in the bubble. The ice boulder didn't have enough gravity to hold anything to the floor. Jack made quick work tying everything to the walls, everything but his sleeping bag, which he unrolled and stuck to the floor with Velcro. He didn't tie the ice block to anything either. It had started to melt, so he herded it into the middle of the bubble and left it there to melt the rest of the way while he got his cooking equipment out.

He didn't have much to cook. He wanted to cook, though. Cooking was important. He had scrounged in the shelves of the station commissary until he found cans that didn't heat upon opening, and he had brought those. "Why do you want those?" the cook had asked. "You'll have to take extra stuff with you to heat them."

Jack had merely nodded and said, "That's why. Haven't you ever been camping?"

The cook had thought about it for a moment, his eyes misting over as he remembered some half-forgotten trip into the back country with his father or a favorite uncle, and he had given Jack the cans without further words.

Now Jack took a can opener and slit the top of a rabbit stew can and emptied it into a cooking bag. He put the bag into the tiny compartment in the stove and connected the air bottle to it and cracked the valve to let more air into the cooking chamber until it was at one atmosphere. It would heat much faster at two or three, but he didn't want to rush it. There was a right way and a wrong way. His stomach rumbled in anticipation. Even at one atmosphere the stew only took a couple minutes to heat all the way through, but it seemed that he got twice as hungry as he had been before just waiting for it to cook. That was the way it should be.

Finally, Jack decided that the stew was hot throughout. He bled the pressure out of the stove and opened the door. There wasn't any food smell yet. He pulled the bag out by one corner and burned his fingers on it getting it open, but when he broke the seal he heard a soft hiss of escaping steam and then he smelled the stew. His stomach growled loud enough to hear.

He had let the stew get too hot. While it cooled he took another bag and coaxed about half the slushy ice glob into it and put a small net bag of fresh ground coffee into the cold water. He had never made fresh coffee in a bag before, but the cook had told him how and he followed the cook's directions to the letter even though it didn't seem right to him. He would have heated the bag at this point, but the cook had told him to just seal it and squish it around in his hands until it looked like coffee, the darker the better. He did that. It took a while to look like anything more than weak tea, but he kept at it until it looked like it might be coffee. By then the stew was cool enough to eat so he left the coffee bag to steep some more while he ate the stew. It was just thick enough that he could use a fork on it. It tasted better

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than he remembered stew tasting. It was even better than his mother's stew that she made in a big steel kettle over the sterilizing furnace in the lab. He remembered other meals he had cooked over a campfire and decided that they were almost as good as this, though. Everything tasted better when you were camping, he supposed. That was good. Even the station cook wouldn't mind that.

The coffee looked good and dark by the time he finished his stew. Jack shook his head at the next step but he followed the cook's instructions and removed the bag of used coffee grounds and put them in the dirty stew bag. The bag of strong, cold coffee went into the cold pouch in the bubble's side, outside the regular skin and the infrared blocking layers in it. Now it would lose heat to space.

In a few minutes it had frozen solid. Jack brought it back inside the bubble and whacked it against the top of the stove until it broke into shards. Two of the shards went into a cup-sized drinking bag. The bag with the rest of the coffee shards went back into the cold pouch for later. Jack swept enough water from the melting glob to fill his drinking bag and put that back into the stove. He let it heat at half an atmosphere for a few more minutes, then took it out and shook it gently to mix it well. It looked like coffee. When he opened the bag to get the straw in he could smell it and it smelled like coffee, too. He tasted it. It was coffee. He would have to tell the cook that it worked.

An enormous yawn caught up with him while he was drinking the cook's coffee. He finished it quickly and sealed the bag again and put the rest of the water in the stew bag and put both bags away in the bigger bag that held all his food. He stretched his arms out over his head and leaned back to get the kinks out of his spine, then unzipped his sleeping bag and crawled in. He lay on his back in the bubble and watched the ring overhead. The ice boulder was nearly through it now and on the night side, though it wasn't really that much darker. Just a little cloudier. Regular stratus clouds now. The sun was behind the ice wall to his left, but he could see where it had to be by the light on the ring particles. Earth would be out that way, too. Earth and all the camping and all the fishing streams he had ever known. It was almost a billion and a half kilometers away.

He looked away from the brightness where Earth would be. He didn't want to think about Earth now.

Straight overhead, something alive drifted down toward the bubble. It was like a flutterby but smaller. Jack didn't know what it was. There were so many new species here in the rings, things that biologists back home would never believe possible. The ice miners tried to catalog them but there was never time. There was never time enough for anything but work and sleep. Work and sleep and thinking about how far they were from home.

Jack watched the tiny living mote land on the bubble fabric. He almost wished it could get in the bubble with him. If it did he would probably wind up swatting it, though, to get some sleep. It would almost surely wind up going for the heat of his face. Better that it stayed outside.

Sleep was catching up with him. Jack

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felt as if he could sleep if he just closed his eyes. He closed his eyes and slept.

II

When he woke he saw that the ice boulder had carried him down through the ring and back up through it again to the day side. He was above the ring by a kilometer or so. It was a grainy photograph again below him. Jack smiled at a thought. He was thinking that he was lying on his back in the bubble, looking out at the ring below him. The ring was so big and so flat that it could only be down no matter what attitude his own body was in. There was no disorientation near the ring. It was always down.

Jack sat up. The walls of the ice depression around him were covered with flutterbies. They were attracted to the heat of the bubble, but evidently the bubble was too hot, even with its infrared shielding, for them to land right on it for very long.

He had intended to make breakfast. Breakfast was part of camping. It was important, but now that he was awake and saw the flutterbies there on the ice he thought about the ring trout waiting for him and breakfast didn't seem as important as it had. He would skip breakfast. He packed half a dozen food bars into his helmet where he could reach them later on when he got hungry, then slid out of his sleeping bag and pulled on his micropore suit. The fabric was a little cold from being next to the bubble wall. It was invigorating.

When he put the helmet on, his right eyebrow began to itch. He tried not to think about it. He turned off the air recycler and the stove and made sure the air bottle was sealed tight, then opened the valve in the top of the bubble and let the air out. The fabric loosened without air pressing out on it, but without gravity it didn't collapse.

Some of the flutterbies had launched themselves away into the air stream, but most of them were still on the wall. Jack took a cooking bag with him and unsealed the bubble door. More flutterbies scattered when he stepped toward them. A few remained on the ice wall, trembling softly. He picked them gently off the ice and put them into the bag until he had a couple dozen of them. That would be plenty. He left the bag outside and went back into the bubble for his fishing pole. The pole was a half-wave ten-meter collapsible antenna off an ice tug, with twists of wire for eyes. The reel and line were straight off a wire pistol. He had bent the barb at the end of the wire pistol line into a hook.

He made sure his suit belt was stocked with handholds and that the fuel tank for the maneuvering rockets was full. He took a large net bag and tied that to his belt as well. When he was satisfied with his equipment he backed out of the bubble and sealed it so that the flutterbies couldn't get in while he was gone. He picked the bag of flutterbies out of space where he had left it and clipped it to his belt. Then, with a light push from his toes, he kicked off to go fishing.

The ice boulder dwindled behind him. It would soon be lost in the distance, but Jack knew that the transponder in the bubble would lead him back home when he was ready to come back. The bubble was a standard emergency survival bubble from one of the tugs in

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for repairs. All the emergency bubbles had transponders.

When he had drifted down until he was only a few meters above the ring surface, he used his belt rockets to bring him close to another ice boulder about the size of the one he had camped on. When he reached it he anchored two handholds in the ice and tucked his feet into the loops. He positioned himself so that he was facing just inward of downstream, about at the edge of Saturn's disk. He watched the ring for a minute or two to get the feel of it. Inward toward the planet the particles were moving in a faster orbit. Outward they moved slower. The difference in speed was not great, but if he watched long enough he could see the relative motion. The effect was of a river flowing past him in two directions at once. It flowed away from him on his left and toward him on his right.

Jack threaded the hook through the eyes on his rod. He had put an eye on the end of each of the six sections of the antenna. When he got the hook through them all he pulled the sections out one by one until the pole was extended. He pulled some more line from the top until he could hold the butt end with the handle in one hand and the hook in the other. He let go the hook and the pole and they stayed where he left them. Then he opened the bag holding the flutterbies and waited until one crawled to the opening. He picked it out by its single wing and reclosed the bag. He spent a moment looking at the flutterby, wondering how to hook it. His excitement to be fishing waned a little. He had never liked hooking grasshoppers or worms, either. He remembered that from before. You always did it because that was part of fishing, but Jack had never liked it. His father had been pleased that Jack didn't like hooking the bait, but he was even more pleased that he still did it. Jack had never understood that, not really until now.

There was a thickening in the wing that had to be the rocket. He plucked the hook out of space and threaded the hook around the rocket, weaving it through the wing that was really the flutterby's body. The two legs at the wing tips thrashed. Jack let the hooked flutterby float free and took the pole in his hand and began stripping out more line and waving the pole back and forth until he had a lot of it out. He was careful to move slowly and not whip the flutterby off the hook. When he had fifty meters or so out he made his first cast. He brought the pole back and waited until the line had all looped back behind him and come to a stop, then brought it forward about halfway and gave a good tug on the line with his other hand at the same time. The line shot forward over his head, the flutterby trailing at the end of it, and stretched out until the flutterby was just inside the ring ahead of him. Jack let it drift.

He waited a few minutes. The flutterby was just visible at the edge of the ring. It wasn't moving much. No ring trout seemed interested in it. Jack couldn't see any ring trout from this angle. You had to be looking directly into the ring to see the trout. He waited a while more. His arm holding the pole began to get stiff.

There was a big chunk of ice just ahead of the flutterby. The trout would probably be in its shadow. Jack tried to

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roll cast so the bait would flip over toward it, but the line just pulled back toward him and went slack. He pulled it back for another cast.

His second cast went downstream of the ice chunk. He waited a while to see if anything would strike, then pulled it back. His third cast was high and didn't make it to the ring. He tugged it back but didn't wait long enough before he pulled the rod forward to make his fourth cast, and when the hook sailed by, the flutterby was gone. He had whipped it off on the back-cast.

This wasn't the way it was supposed to work. Jack wondered if this trip had been a good idea after all. It had seemed to be working last night, but now he didn't know. Not catching trout was very frustrating. He told himself that he had to be patient, but he didn't feel patient at all. He felt frustrated and angry.

He took a few deep breaths. On the job, when things went wrong, he would always take a few deep breaths to calm down. Give it a chance, he told himself. The first guy to try this on Earth probably didn't catch one on the first cast, either.

Feeling a little more patient after the deep breaths, he reeled in the line and baited the hook with another flutterby from the bag. He stripped out line and cast again, this time deeper into the ring. He cast almost straight down. The flutterby went deep into the ring before it hit a tiny chunk of ice and stopped. Jack reeled in some line to get the slack out of it.

There was a flash of motion near the flutterby. Jack felt the line surge as the trout hit it. The pole dipped down in an arc. The trout was firing its rocket to get away. Jack pulled on the pole, but instead of pulling the trout out of the ring, the tug on the end of five meters of pole and another couple of meters of Jack simply spun the ice boulder around until he was holding the pole straight overhead toward the trout. Momentum took the boulder on past that point until he was bent over almost backwards, then it slowed to a stop under the pull of the line and swung back again. The trout was still trying to get away. It had quite a lot of thrust for a biological rocket, and a lot of fuel. Besides just spinning the boulder Jack had anchored himself to, the trout was pulling it deeper into the ring.

The trout finally ran out of fuel. It continued trying to get away with its pellet launcher, the reaction surging up the line in waves as it threw pellet after pellet, but the real fight was over. Jack began reeling in line. The trout came thrashing out of the ring. The ice boulder continued in the slow spin left over from the trout's last tug. The trout seemed to leap sideways each time Jack pulled on the line, and it took him a moment to realize what was happening. The trout was going into orbit around him. The trout was at the end of a line tied to a spinning ice boulder; what else could it do? Jack was glad that the boulder was as massive as it was, or conservation of momentum would start it spinning faster and faster the more he reeled the trout in.

The trout ran out of pellets to throw. All it could do now was wriggle at the end of the line. If it had enough time to generate more fuel, breaking down water into hydrogen and oxygen, it

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could put up another fight with its rocket, but for now it was exhausted.

Jack used his own maneuvering rockets to stop the ice boulder's motion. The trout at the end of the line kept going in its arc, and Jack had to reel it in fast to keep it from whacking into the ice. He reeled in line and the trout swung wide and then toward him. Jack held the pole high and the trout swung by just over his head and back out again. As he reeled it in the trout made three more orbits around the tip of the pole.

Jack could feel a laugh building in him. When he'd gone fishing with his father, his father would laugh because Jack was always too eager to land his fish and he would pull it clear onto the bank just in setting the hook. Jack would always wind up with the the line tangled around a tree branch and the fish dangling out of his reach overhead. His father would have to climb the tree to untangle it and he would laugh all the while.

Jack laughed with his father. He wasn't frustrated anymore and he wasn't angry. And neither was he lonely. He felt deep into his soul but he couldn't feel the loneliness there at all. It was gone.

He reached out and caught the trout as it swung by on the end of the line. It was as long as his arm and twice as thick. Its tentacles grasped his suit and held on. Jack removed the hook from the trout's mouth. He pulled the net bag from his waist belt and put the trout into the bag, pulling the tentacles free and tying the bag closed. He anchored it to the ice with another handhold. The trout reached out through the net and gripped the ice as well.

Jack thought about trying for another trout. It was tempting. This first one had definitely been a rush. His heart was still beating hard and he was still smiling from the experience. He had plenty of time, though. There was no reason to rush it. If he could catch a small one he could try it for dinner, but he only needed one to eat and one to take back to the station and he still had all day ahead of him.

He pulled his feet from the handholds and let himself drift away from the ice boulder. He was hungry now. Catching the trout had made him hungry. He turned his head to the side and bit a food bar from its clip and began to gnaw on it. Food bars were tough going. They weren't bad, though. In fact they tasted pretty good out here, out in the rings with a trout in the bag and camp not far away. Jack chewed on the bar and drank water from the suit nipple and savored them both. He wished he had thought to bring some coffee with him. He would have some soon enough when he got back. When he got back he would take a couple more fragments of the coffee ice and heat them with water in the stove and have fresh brewed coffee. He could taste it already.

He would tell the cook that his coffee had worked. He would tell the others that fishing had worked. He would come back relaxed and holding his trout up with pride and the others would know that it had worked. He looked up toward the sun. Earth was out there, too. It was a long ways away, but not so far as it had been. ■

With apologies, and thanks, to Ernest Hemingway.

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on gaming

Matthew J. Costello

Recently, while attending a large press conference, I had an interesting conversation with a colleague.

While we sampled the crisp carrots, he asked me how I liked *Zak McKracken and the Alien Mindbenders*.

Now, lest you think we were having an esoteric discussion about some new age/minimalist rock group, I should tell you that *Zak* is the new game from Lucasfilms Ltd. (PO Box 2009, San Rafael, CA 94912.) I said I really liked it—not a comment I make about a lot of computer games these days.

He fixed me with his best quizzical stare and asked, "Why?"

Hmmm, I thought.

Lucasfilms had a great success last year with their game *Maniac Mansion*. It was a clever, satirical game about some teenagers trying to rescue a friend from a mansion operated by a quite mad scientist and his helpful, if deranged, minions. The game was a highly animated adventure, and all actions were accessed by the joystick, selecting from over a dozen commands.

You clicked on a command, say "Open" for example, and then moved the joystick to point at the cupboard or refrigerator. And presto, the fridge popped open, displaying a gooey red mess. . . . (Just ketchup. The scientist and friends were messy eaters.)

The mansion had plenty of rooms and surprises, with everything from a working nuclear reactor in the basement to a crucial key at the bottom of the inviting, but radiateds pool.

Justifiably acclaimed, *Maniac Mansion* was a breakthrough game.

Back to my friend's question . . .

"Well," I said, mustering all the conviction I could, "*Zak* is a very witty, whimsical game."

I realized that whimsy wasn't perhaps the greatest criterion for a game and quickly followed that point with the observation that *Zak* "opened the doors" of the format used by *Maniac*.

In *Maniac Mansion* nearly all the action takes place within the environ of the mansion. There's plenty to do, doors to be opened, traps to be sprung, pianos to be tape-recorded, etc., but it's all confined to that one location.

But not Zak.

The saga of Zak decidedly precludes that. Zak is a tabloid reporter who yearns to write a novel. In a long, entertaining opening sequence, Zak gets an assignment from his cigar-chomping editor to investigate a story about a two-headed squirrel. But Zak also has a strange dream of tall aliens chasing him, and a girl he's never seen before.

While Zak doesn't realize it at first, we know that the aliens are operating a machine to make mankind stupid—as if such a device was needed. The rather distinctive-looking aliens don nose glasses—you know, glasses with a big rubber nose and a Groucho-style mous-

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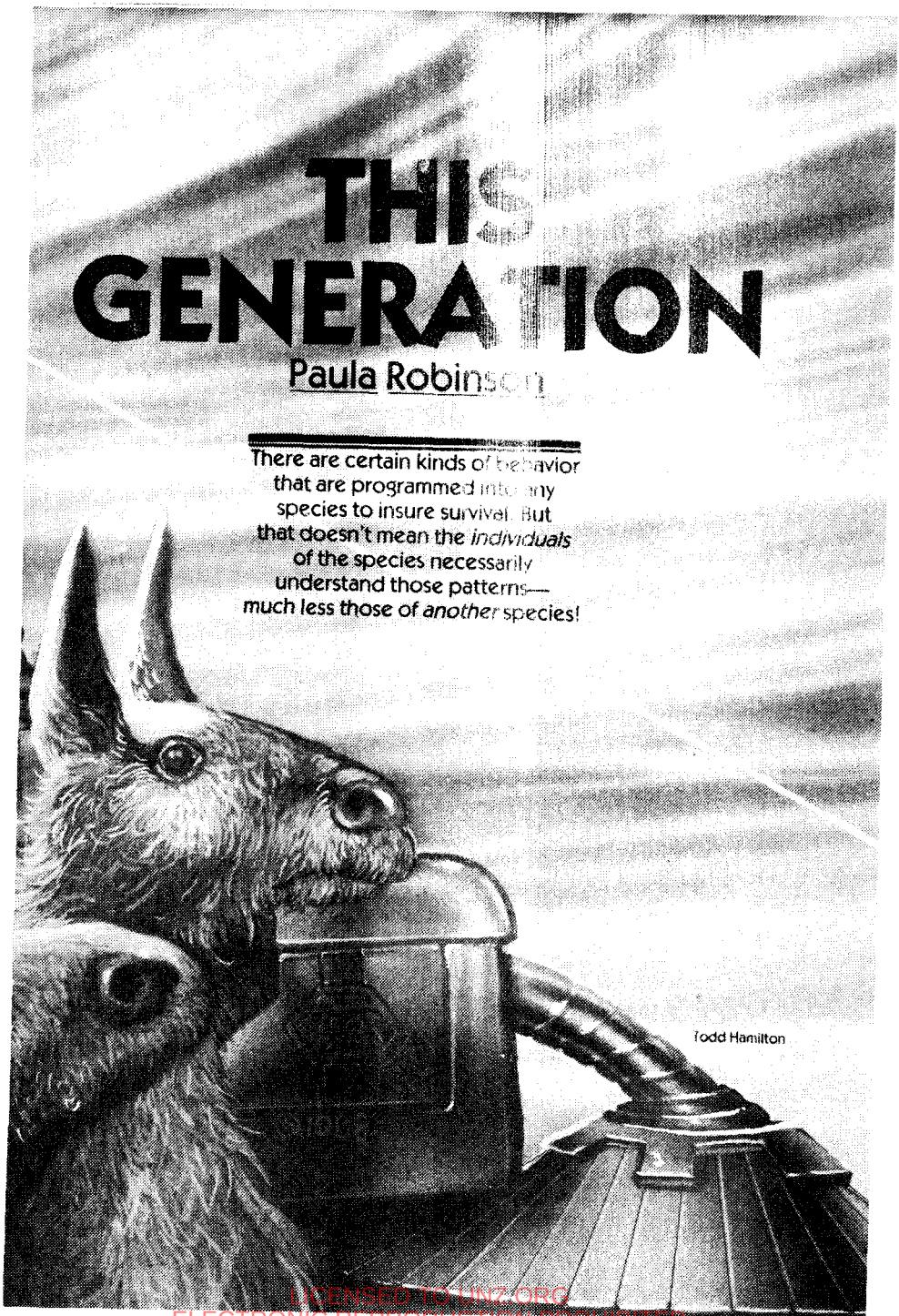
THIS GENERATION

Paula Robinson

There are certain kinds of behavior that are programmed into any species to insure survival. But that doesn't mean the *individuals* of the species necessarily understand those patterns—much less those of *another* species!



Todd Hamilton

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Andra circled a slab of rimrock. The air scooter she rode moved forward in spurts, responding to her impatient tugs at the power bar. She'd wanted to start driving the mob early, but two of the females had stopped for joeys to find the pouches. Besides, the dogs were still feeding. She'd killed a freak female 'rine for them that had developed milk glands and hooves. You couldn't keep freak animals like that. They fell behind on the drives.

A flicker of light, she'd noticed earlier on the horizon, began to burn. Andra gritted her teeth as the hull began to scream on the atmosphere. Minutes later several of the kangarines flicked their ears at the sound of the crash. Fortunately the 'rines had become accustomed to it, so it didn't startle them.

Andra kicked at some weathered rock, which obligingly crumbled. All she needed now was one of those off-world scientific parties nosing around with their noisy ships and jackhammers and graduate students to gawk at the 'rines.

At least, that's what she thought it would be like. On K-4, a little spit-patch of a planet, you couldn't learn much about what was going on. Like the flora, fauna, and most of the people, the government on K-4 was standard issue. Fifty standards ago, bare necessities had been dropped to turn this lifeless rock into a world for eventual commercial use. "The developers didn't think the cost return rated an elaborate infrastructure." She'd read that, in some old magazine.

The scientific party would be just in time to scare the hell out of the mob. Andra knew they had to investigate the ships. Why did the damn things have to start falling now? She'd split from Sam's mob just in time for this wave to appear. Nobody seemed to know where they came from. Jettisoned pods from some deep-spacer that needed to lose weight, probably.

Of course, they had to appear now. What else could have come out of nowhere to complicate her plans? Now that she was a few months past eighteen standards she needed her freedom. She loved Sam, but his parental behavior had become abrasive. So she'd taken off on her own, and everything, absolutely *everything,* was going wrong.

'Rines were as fast on the hop as kangaroos, but they hadn't gotten any brains from the cows, pigs, or horses whose genes made them so versatile. They were frontier animals that could be adjusted for a variety of needs. Leave them alone and they looked like kangaroos, but produced half as much meat. Give them hormones and remove the pouches and you could milk them. Feed them other chemicals and they could be ridden or used as draft animals. They still did that a lot on younger frontier settlements.

The cost of all the genetic tampering was an occasional freak like the one she'd killed for the dogs, but those were rare, and overall the benefits outweighed the costs.

Andra impatiently surveyed the shallow buttes and stony outcroppings to figure out the best path for the mob. She'd been born here, so the oddness of the terrain didn't affect her. Outsiders commented on it, though. When engineers stabilized K-4's tectonics for settlement, they created massive

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planetquakes that shattered the bedrock. The tsunamis that resulted washed briefly through. The result was shallow buttes and the strangely angled formations known as rimrock, sedimentary sandstones and shales that jutted out of the land like the upraised scales of a fish. Visitors tended to compare this part of K-4 to southwest areas in Earth's North America. If the climate was drier, Andra supposed, then the grass and weeds wouldn't be here to feed the livestock. Custom-tailored animals for a tailored environment. This planet was an artificial womb for commerce. At this stage that meant agriculture and meat production.

Like kangaroos, 'rines had a self-sustaining muscle in the leg that kept them from burning off their meat on long drives. Like cattle, they were big, and like horses and pigs they were strong and could be trained if those genes were activated early in their lives. However, it was obvious to Andra that *this* mob hadn't eaten any brain-enhancing chemicals early on. They could handle the uneven terrain wonderfully, sure. But they lacked any trace of a true herd-instinct. Like kangaroos, they wandered around in an amorphous mob that was a damned nuisance to drive.

Which wouldn't help if Sam was coming after her.

She whistled to the dogs. Travis obediently left the carcass. Mega was more reluctant to stop feeding. It was obvious that she'd be dropping puppies soon, which was another frustration to Andra. It was just another obstacle to slow her down.

The mother kangarines had licked paths in their fur for their embryonic infants to follow toward the pouches. If the mob weren't so small, Andra would have risked placing them in the pouches manually, but these animals weren't tame enough for that kind of treatment. Too bad Sam hadn't been able to afford birth delay shots. Well, she couldn't do anything about that, or about the animals' skittishness. Best to let things go at their own pace. All she needed was a panicky mob of red kangarines.

Things had been good, working with Sam, for a long time. She couldn't imagine what might have made him turn so sour. For the last few sun periods he wouldn't tell them where he meant to sell the mob, which was enough to chafe any boomerwhacker. Then he started acting, well, weird. He outlawed booze, and forbade excursions into the few small towns dotting the trail. The cut in pay was the final insult that had cost him half his workers and left the rest too overworked to stay long.

All that didn't bother her as much as the way he treated *her*. She hated it when he was overprotective, especially when she was around the other 'whackers. For some reason he'd even seemed scared to have her around the 'rines. Enough was enough. She was eighteen standards, a woman, and had handled 'rines since she was twelve. There'd been no excuse to treat her that way.

He should have seen it coming. She was as fed up as the others. So last night they'd all taken their shares of the mob and headed out in different directions while he slept.

Of course, he'd come after her. Even if he was beginning to get trail-crazy, she'd be the one he went for first. After

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all, she was his daughter. Maybe that's why the 'whackers had talked her into leaving him, too. They knew.

The thunder of a second explosion from the crashed ship jolted her. She'd have to face Sam, true. But until then, she had a mob to drive.

Maybe one of the military outposts would buy with no questions. They were pretty hungry up there in the north.

Both of the female 'rines were standing. Andra checked the ground around them to see if they'd lost any joeys. All seemed clear.

The dogs had circled the mob until it coalesced. Andra maneuvered the air scooter. Gradually circling, she and the dogs coaxed the group to move forward. Then she broke with the whistle that told the dogs to race ahead. Soon they were out of sight.

"Hi-YAH!" she shrieked, and fired a half dozen sonic pulses to either side of the mob. They were off at fifty km/hr. Two or three kilos ahead, the dogs would stop them. After that they'd all rest, and then begin the process again.

Sam heard the crash. His knuckles were white on the handles of his air scooter. He dreaded the smoke on the horizon.

Another one. He'd seen two fall since he started driving the 'rines, and had heard of two others in the region before that. He'd left the dogs behind to hold what was left of his mob inside a sonic fence.

Pushing the silent engines, he cursed his overfed frame for at least the hundredth time since he began this chase. It slowed the scooter. And he used to be in such good shape, in the military. . . .

The thought made him wince. He wished he hadn't worked in the planetary force before Andra had been born. If he hadn't, he wouldn't have been forced into this mess. He wouldn't have had to understand the danger these alien ships could represent, and he wouldn't be wondering if Andra was the one with the notch-eared female. If it killed one of the other idiot boomerwhackers, he could live with that. People died in this trade. But if it killed Andra? No. He couldn't think about that. His wife had died after Andra's birth because antiviral agents were scarce in the epidemic of '61. One pointless death was plenty in any family.

He pulled up to the smoking hull and was off the scooter before it had completely halted.

The nose of the craft was crushed.

A second glance sent a shock through his solar plexus. A flattened slab of rimrock confirmed his fear. The nose of the craft had been opened by the impact.

The vital casing was broken. White blobs squirmed helplessly on the ground. Sam stared. An instant later he stamped the ground, hard, hurting the bones in his foot. If that female 'rine died, they might lose all of them, and it'd be his butt. Not Andra's—he'd lie to protect her if he had to.

Assuming one of those little white blobs didn't grow up with a taste for human flesh, and assuming Andra didn't have the bad luck to find that out, then all he had to fear was the army. Well, that and maybe a few dozen irate scientists.

God, why had Andra gotten inde-

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pendence fever *now?* He would have let her handle the ranch while he drove the notch-ear, but he was afraid to leave her alone with those ships crashing everywhere.

The eggheads had to learn more about the little white blobs. Everything from germ warfare to planet-seeding had been suggested, but nothing was really known. They couldn't poke the things around much or magnetically resonate them or scan or anything like that, because the damn things died. They'd called the next system to ask about all this, but it took time to get the transmissions. In the meantime, the notch-ear was their only hope—and their worst danger.

Was Andra all right? Was she? Sam tried to ignore his thoughts while he stared at the bits of life on the ground.

Andra moaned. The shadow of a huge layer of sandstone, tilted by some forgotten earthquake to forty-five degrees, had moved past her. The harsh red-yellow morning light hurt her eyes. She was thirsty. Her gut ached. She tried to ward off the morning by burrowing deeper into her sleeping bag but, finding that it didn't work, she gave up and stretched instead.

A young 'rine grazed casually at the edge of the camp. It sat on its haunches chewing a mouthful of scrub, its big eyes fixed on her, dimly alert.

"What?"

The 'rine jumped back uncertainly.

She glanced around. The mob was unsupervised. Several of the animals had wandered off into the maze of rimrock and weathered buttes.

"Travis! Mega, you bitch! Where—"

Then she saw it. Blood stained the ground next to last night's fire. Had one of the dogs gotten too rough with one of the boomers? Most aggression had been taken out of the animals by the geneticists, but if one was scared or startled—

She whistled and was relieved to hear Travis barking at the edge of the sandstone slab. She signaled again. Travis whined but refused to come.

Then she heard a yip of pain.

"Oh, no. Mega?" She jumped and ran.

Travis met her, then ran back and stopped a few meters from a small depression at the far underside of the rock.

Andra knew at a glance what was happening. Mega was bleeding, all right, but not from a wound. Two pups suckled blindly as she strained to whelp a third.

Andra knelt to reassure Travis, who was nervous from the cries of pain and the sharp snaps Mega had undoubtedly delivered when he tried to investigate. "Sweetheart," she mumbled to Mega, "your timing is fantastic."

There was nothing to do but wait it out. Trying to control the mob with only one dog would be impossible. Andra tried to think about killing the pups, but found it unthinkable.

Sam had always said her "female" feelings hurt her work. Practically, Andra had to agree. She had to move on. But Mega's pups? Andra knew she couldn't live with that. The sense of betrayal would be too strong. Mega was more a pet than a work dog—that's why she'd brought her despite the pregnancy. Pets are family, and you don't abandon family.

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The last thought struck her like a blow. *You don't abandon family.*

Andra scratched Travis between the ears for a few moments, then led him back towards the 'rines. They were grazing lazily. A few rested in the shade from rocks or young trees.

She stirred the fire and scanned the horizon. She was surprised to see smoke still rising from where the ship had crashed. The few lines in her forehead deepened as she watched. You never knew what to expect from those things. It was enough of a surprise that they were even there.

Andra wondered if the scientists had discovered what they were and where they came from. She sensed something about them—some sort of, well, mystery—but then, Sam had always told her she had a wild imagination.

He'd find her. It would be an ugly scene. What would she say? He'd been so hard to figure lately.

Somehow they'd iron it out. Everything would be all right again. It would have to be. Sam was family.

Sam watched the flames rise as he circled the wreck. He knew this solution wouldn't go over too well with the army, but the things were loose and he had to do something. Last night he'd doused the creatures and the capsule with kerosene and lit it with his hand laser. It was all he could think to do since the laser wouldn't burn the white, reflective skin of the squirming things.

A squirming in the pit of his stomach howled at him to find Andra. Yet he knew he couldn't leave until they were all dead. His mind drifted over the military briefing. It hadn't been very reassuring. They knew where the ships came from. Signals had been coming from that region of space for years, but K-4 lacked the technology to decipher or even pinpoint them. Such was the level of expertise found in small colonies.

The white blobs were some kind of eggs or larvae, but what kind they couldn't know. Nothing like them had ever been studied before. About all they'd been able to figure out was how to keep them from dying. That required a carefully controlled environment. That was why they needed the notch-ear. Her body provided the exact environment they needed. The things could survive there. They wouldn't develop, but they wouldn't die either.

Was this whole thing an elaborate kind of germ warfare? Or were these things something else? Nobody was sure. Well, whatever they were, Sam thought furiously even as he rejected his own anger, they shouldn't have come without goddamn *instructions*.

They couldn't transport the notch-ear by air or freight because kangarines, like their Australian parent stock, were notoriously stupid. Stress upset them enough to blow the whole experiment; the notch-ear could panic and injure herself, or even simply upset her own body chemistry. However, the 'rines on this planet were accustomed to being driven by boomerwhackers and dogs—so he'd gotten the lovely job of getting the notch-ear to the more sophisticated labs in the Northern provinces.

It probably wasn't in Andra's group. Rationally, he knew that. The knowledge didn't loosen the knot in his stom-

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ach, though. He knew it *could* be in her cut of the mob.

He paced back to the wreckage. The things wouldn't be so horrifying if he just knew what they were. Killing them was no joy—they weren't even fully formed. No matter what they were, Sam knew beyond doubt that he had to protect his own planet and species. Even if the unthinkable were the case. Even if they weren't just alien animals.

No matter; they were all dead here. Nothing could survive that kind of heat.

He checked the craft to be sure. He walked past the tail of the craft when he heard the slightest of noises. The wind?

It persisted: *Kuh, kuh.*

Sam peered at charred ground that moments ago had been covered with squirming blobs. Nothing could have survived.

Kuh.

He traced the source of the sound. His hand laser fell to the ground when his gaze met a crimson trio of eyes.

The thing stared back. A glint of curiosity was somehow discernible on the bizarre, mismatched features. Intelligent curiosity.

One large eye dominated the center of what was apparently the face. Two smaller ones perched above it at the base of a small crest. The skin was a charred blue; it sloughed away from two rough lines on the belly. The mouth was in the right place, though it had two tongues and resembled a beak. The body was very round. He couldn't see any legs, although they could have been folded under its belly.

Kuh.

It stared as if expecting him to do something.

Andra knew she had to go back. Mega's full attention was on the six tiny, blind pups. Travis gadded about, unsure of what to do. Andra didn't feel very sure of herself.

Her bravado had faded. She'd learned long ago that she could toughen her hide enough to do what had to be done—she'd had to kill enough animals. But those things were matters of survival. She could justify killing for self-defense, for food, or for the sake of the mob, but not for greed. She'd have to face Sam eventually. She'd only be delaying the confrontation.

Andra could see the extra greenery that denoted springs near the crashed ship. She'd start by going back to where the ship had crashed. The mob and the dogs could stay at a water hole. She could net the 'rines in a sonic fence and leave the dogs there, then find Sam. But which trail had he followed, looking for her among all the deserting boomerwhackers?

She'd just have to find out. She extended the rear compartment of the air scooter to make room for Mega and her brood. The sooner she faced what she'd done, the better. The scientific party there might have heard about Sam on one of their supply runs into the nearest town.

Well, she comforted herself, Sam —Dad—usually accepted her apologies if she looked sorry enough. That part wouldn't be hard.

Kuh.

It wormed its way out onto the still

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smouldering ground, huddled amongst the ashes. Two handlike organs near its head dug into the hot ground. For heat?

Sam watched for several minutes. It blinked its three nictitating membranes and stared back. Occasionally it scratched. It did nothing to warrant a flash of laser.

Again, Sam reviewed the briefing. The ships were sent by something intelligent that had either been in a tremendous hurry or was not technologically well-advanced, or both, since they hadn't equipped the ships to soft-land. The life forms in the ships might or might not be sentient. They could be instruments of biological warfare, or they could be "sample" life forms for human investigation. Although unlikely, it was possible that they were even ambassadors —or children.

The latter possibility kept Sam from frying the little thing. All he needed was to be the source of an interplanetary incident. If he wasn't, already.

Would he be blamed for burning the little white blobs? He hadn't know what they were. But now he was dealing with a baby. A baby *what* he didn't know—which complicated the problem. To deliberately murder what might be the child of an intelligent species was a serious matter.

Kuh.

What did that noise mean? Sam repeated it as best he could. The small creature blinked each of its eyes in response and huddled closer to the hot ground.

He was just trying to figure out whether it would be safe or wise to touch the creature when a familiar sound came over the horizon. Although Sam didn't dare look away from the creature, he guessed from the noise that it was at least two helicopters and a single-engine plane.

The 'copters settled down several yards away in a rush of artificial wind. The creature tried to dig deeper into the ashes. Sam risked a glance and saw that a flood of men in scientific and military garb were pouring from the two crafts' doors. The ludicrous thought came to him that he wished they'd go away—he had enough trouble. Then, suddenly, he grew intensely dizzy. He turned his gaze back to the thing in the ashes—and fainted.

Andra swore. She'd kept the mob under pretty good control considering that she could only use one dog, but the 'copters had spooked some of the 'rines and sent half the mob off into the rocks. The cramps and bleeding weren't helping her mood much—she'd made that delicate discovery, along with the fact that she was out of the simple medicines that usually made this time of the month no problem, before putting Mega and pups in the back of the scooter.

Everything, *everything* was conspiring to make this harder.

She knew Travis could handle the faction of the mob that was moving ahead. She'd have to head off the ones that had bolted from the 'copters.

Then it occurred to her that she didn't have to waste time chasing the 'rines. She could easily use pulse to get them to move back. She aimed well off to the far side of the running 'rines—and then the scooter grazed an angled rim.

The pulse went entirely too near the animals. They bounded straight over the

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other part of the mob and raced directly toward the wreck.

"You STU-pid GOD-damn mar-SUpial ASSes—"

Andra raced after them. They were headed for a modest ridge concealing the crash. She pulled up alongside and aimed the pulse gun when they suddenly stopped.

They must have been spooked by the wreck, she thought hotly, shouting insults and slowing the scooter, which sailed over the ridge to leave the mob behind.

"You *set* this fire?"

The scientist at Sam's elbow, a late-thirtyish type with a scrawny black goatee, was horrified. The military leader, Commander Reiken, who had asked the question, merely stared.

"Dr. Lampan! Over here."

The scientist ducked away to see what was exciting his assistant in the charred wreckage.

"And you lost the notch-eared kangarine." Reiken was trying to sound angry, with little success.

Sam babbled. He couldn't seem to piece together the events of the past two days. His worry for his daughter, the nonstop chase after the notch-ear, the stun of awakening . . . too much. He'd just explained about losing all his boomerwhackers. Commander Reiken had rallied and was starting to shout.

"Commander!"

"I'll get back to you," the commander sighed, and strode toward the excited scientists.

"Oh, my God," Sam moaned.

"Oh, my God," Reiken moaned from his place near the wreck.

"FUCK-ing STU-pid kanga-RINES," Andra howled as she and the scooter roared over Sam and the scientific party's heads. "Oh, shit! Now what?"

She stopped some meters past them.

"Don't fire!" Sam screamed to the commander, who repeated the order to his men seconds later.

"Who the hell is that?" he demanded.

"Sam! Dad. Daddy?" Andra said as he almost bowled her over.

"Good God, I forgot—the creature," Sam blurted as soon as he was sure his daughter was alive.

"This is crazy," Reiken muttered. Some of the scientists and soldiers laughed.

"We know about the creature," Lampan said softly. He stared pointedly at the commander. "I've radioed the plane. They're looking for a landing site."

In the silence following Lampan's statement, Andra asked, "Does anybody mind telling me what's going on?"

"I wouldn't mind knowing, either," Sam added with weary sarcasm.

Reiken exchanged a glance with Lampan. "I guess they'll find out anyway," he told Lampan. Lampan shrugged, obviously unconcerned about military secrets.

"It's going to take them a while to get here," Lampan suggested.

"Right. OK. I think you two better sit down," the scientist told Sam, leading them away from the scientific crew.

"Wait a minute," Andra told him, her brow furrowing in annoyance. "I can't stop for this. My mob's gone off. I have to round them up."

"The mob can wait, Andra."

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"But Dad—"

"Sit down, Andra."

She sighed, began to sit, winced slightly, and stood again. "Does anybody have an ibudol?"

Andra and Sam found the plane when they returned to the crash site. They and Travis had managed to reunite the scattered mob by mid-afternoon, leaving Travis to keep watch over the sonic enclosure.

The job had been more difficult, Andra observed, because Sam had developed a habit of eyeing every single 'rine. Well, at least he'd had the ibudol tablets. That helped.

She was about to make a crack about Sam's obsession with the 'rines when something caught her eye. "What's happened to this ground?"

Her question concerned markings and stains mingling with the human footprints leading away from the small plane.

Sam stared at the discolorations. "Must be mechanical fluid from whatever made the tracks," he commented.

"Funny color for mechanical fluid."

"Dirty oil can be any color."

Andra nodded, paused. "Are you going to punish me for leaving?"

"You deserve it."

"I know that. The question is, are you going to?"

"We'll see."

"Sam—Dad—I don't deserve that. Tell me."

"There's a lot more to this whole thing than you realize, Andra. We'll worry about it later."

"I'm worried about it now!"

"Andra—"

Their argument stopped abruptly when they came into view of the ship. Sam was first to notice the creatures, cutting his sentence short. Andra continued to protest her adulthood until she, too, saw them.

The humans surrounding the alien couple were silent. Lampan glanced up to see Sam. He broke away from the fascinated group to grasp his arm. "Did you find the notch-ear?"

"No. It wasn't in Andra's mob."

Lampan's face fell.

"What. . . ?"

"Later." Lampan rejoined the group.

Sam and Andra parked the scooters and slowly walked closer. The aliens were oblivious to the humans surrounding them. All their attention was focused on each other. One gently stroked the other's crest, which ran the length of its back. The other had what appeared to be gaping wounds all over it. They leaked the oddly colored fluid that had discolored the ground near the plane.

"Damn," Sam whispered, eyeing the creatures' method of locomotion.

The hind legs, clearly visible on the infant, were atrophied on the adults. They folded uselessly over leathery, segmented bands of muscle at their undersides.

An acrid smell filled the air. Harsh vapors rose from the injured creature's wounds. Andra was astonished, then disgusted when she saw that one of the pockets was swollen with an abscess. Moments later, however, the abscess opened, and from it came an infant. Bluish skin hung in tatters from its body.

Andra's stomach heaved while Sam, Reiken, Lampan, and the rest exhaled

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in relief. The wounded creature reached down to stroke the chest of the infant.

The wave of nausea that had overtaken Andra moments ago dissolved into compassion. Here was a wounded female trying to help a dying baby. From the looks of both of them it was pretty hopeless. How could these men be so insensitive?

"Thank God," Lampan was saying. He and Sam traded a look of understanding.

Andra glared. "Can't you see they're dying?"

Lampan's eyes widened. "What?"

"Look at her! She's bleeding. And the baby's lost its skin from the fire. What kind of people are you?"

Sam grasped her shoulder. "Andra—"

"Don't stop me, Dad! When Mama died I almost . . . I was just a baby. How can you watch this happen to them—maybe they're even the last ones—"

Something glinted in Sam's eyes.

"It was just a *baby*. And you burned it! It's going to die, and its mother's going to die, and that poor male is going to have to go on without either of them."

"Andra, the baby and the mother are both fine."

"What do you mean? Look at them."

"That's how these creatures reproduce, Andra," Lampan explained quietly. "They need extreme heat. Without it, their skins can't be shed and they can't develop." He smiled slightly. "Your father didn't harm the baby. He saved its life."

"But all the others—"

"All the others weren't lucky. They were in the middle of the fire too long. The one you see was right at the edge of it." Lampan paused, glanced at the commander, and continued. "Normally, these things develop in the pouches you see on the female. They contain caustic agents that produce the needed heat. It's a little like the pouch of a kangarine. Without it, an embryo of their species can't develop."

"The reason I was so paranoid about the 'rines, Andra, was because they were using one as a sort of holding tank for some of the embryos," explained Sam.

Lampan nodded. "The developers must have received transmissions before seeding K-4. Kangarines are more than frontier animals; they're perfect for the embryos. Probably no coincidence there," he mumbled. "We were just lucky enough to figure it out in time."

"You mean 'rines were manufactured for that purpose?"

"Maybe. We can't know. Probably the developers didn't want the colonists to panic—or to refuse to come."

"So you couldn't know until now what the embryos would do," Andra added for him. "Or even what they *were*." She stifled resentment toward the unknown people worlds away who so casually ruled K-4's fate. "You weren't getting enough information."

"Exactly." Lampan nodded for emphasis. "The adults seem to realize that, too, which is damn lucky for Sam. For *us*." He sighed. "Your father had to transport the notch-ear to the northern labs. We have better facilities there to study them." His eyes widened as he finished the statement. "Study them! Good God, what am I talking to you

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people for? Excuse me!'' He retreated to observe the alien couple.

''So that's why you were acting so weird,'' Andra breathed. Sam gave her an odd glance. ''I mean, that's why you wouldn't let us leave or the mob, drink or fool around.''

''You and the boomerwhackers? No. I couldn't risk the mob. Not even that much.''

''Why the cut in pay?''

Sam laughed dryly. ''I should have demanded pay in advance for delivering the notch-ear.''

She echoed Sam's chuckle as she glanced at the aliens. Andra felt strange under the stare of six red eyes. Why did extraterrestrials always have to be so ugly?

''Andra,'' Sam asked in a steady, level tone, ''is there any chance that you lost a notch-eared female from your cut of the mob?''

Lampan turned to listen; apparently he had overheard the question.

''We had to kill a female for food the other day,'' Andra answered.

Both Sam and Lampan jerked. *''WHAT?''*

The helicopter made Andra queasy. She'd never been in one before. Floating around in a dizzy bubble held up by noisy, skinny blades made her nervous. No wonder the aliens insisted on riding in the plane.

The radio blared sporadically. Occasionally the pilot shouted into it and received unintelligible replies. This went on for a few minutes.

''What are they saying?'' she shouted into Sam's ear.

''I don't know. I can't hear,'' he shouted back.

''The plane's veering off. So's the other 'copter.''

Sam shouted to the pilot, who yelled back into his ear.

''What did he say?''

''He said they're low on fuel. We have to check out the dead 'rine. We'll rejoin them later.''

''I hate the army,'' Andra grumbled, too low to be heard. ''All this damn sneaking around.''

Andra had spied the carcass first. Years of boomerwhacking in this country had taught her eye to know the reddish brown pelt of a 'rine from the buttes and rimrocks.

The carcass had already begun to rot. The local bacteria worked fast.

''That's not the one,'' Sam told the pilot.

''You're sure?''

''Look at the ears.''

''Well, I still have to cut the thing open.''

''Oh, wonderful,'' Andra commented. She had to hold the torso so Sam and the pilot could slice into the belly. She'd done it hundreds of times when they butchered 'rines at home, but none of those stunk like this one.

''Yeah, I see what you mean,'' the pilot apologized to both of them. ''There's nothing unusual in here.'' He severed something in the abdominal cavity and pulled it out. ''The uterus,'' he explained.

''Doesn't look like a uterus.''

''That's because they have two. If you don't feed them chemicals, they

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reproduce like kangaroos. Not much like mammals really."

"Yeah. No kidding." The ache in Andra's belly was returning with a vengeance.

"The wombs are up here, see? Only one horn each. They empty into this middle part. The tubes on the sides are both vaginas. The one leading to the outside is—"

"I know what that is. I've seen joeys come out of it!"

"Have another pain tablet, dear," Sam muttered.

"Dad, you can be so exasperating!" Even so, she didn't argue. Her head was starting to ache anyway. She swallowed the tablet dry while the pilot put the strange organ into a plastic case.

The ride back was particularly unpleasant. Andra reflected that it seemed to take hours, even though it only lasted thirty minutes. The air in the cabin was hot and close. There hadn't been a water hole for washing.

Suddenly, Sam was shaking her shoulder. "We're about to land."

"Hunh?"

"You dozed off."

"Oh." She blinked against the slanting orange light of late afternoon. "This isn't the crash site."

The landscape was slightly changed. The rimrocks were absent and the buttes were more weathered. Thick vegetation clung on dark volcanic soil that hissed against the bottom of the craft as it landed near the other two.

"We're up north," she commented as they disembarked. "About forty or fifty kilometers, at least."

"They got a report on the notch-eared 'rine."

Andra's eyes widened. "They found the other babies?"

"The 'rine is dead, Andra."

Her face fell. "Oh."

The pilot nodded. "The boomer-whacker killed her. Noticed she was 'acting funny.' He said he didn't need a crazy 'rine slowing his mob down." He smiled wryly. "Turned out he tried to sell the rest at the outpost near here, though, and mentioned it to them. That's how we found out. Lampan's group is looking at the carcass now. It's in pretty uneven country, so we'll have to walk."

"It's a good way," Sam told her. "Maybe you'd rather stay in the 'copter and nap."

"Don't be stupid. Sorry. No, I want to come. I . . . kind of have to. If you guys don't mind waiting a minute while I disappear behind this damn butte."

Sam smiled. "No problem."

Lampan and the others fought nausea—some unsuccessfully—when they found the carcass. Internal decay had made it hot to the touch. Up here, under moister conditions, decay could do that in a matter of days or even hours.

The aliens waited nearby. The female seemed terribly distressed by the smell. She clasped her infant as if it were a nosegay.

The male still ran his hand along her crest, but hesitantly, delicately. Andra couldn't help but interpret it as a gesture of reassurance.

Well, like Sam said. Sometimes her feelings interfered with her objectivity. You could never tell what aliens were

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feeling unless they told you, and sometimes not even then.

"I don't see much of a chance," Lampan was telling Reiken. "The carcass is in pretty bad shape."

"You have to dissect it," he replied with a note of reluctance.

"Right." Lampan sighed and cut the belly.

The viscera spilled out explosively. Lampan backed away, followed by the other humans in the immediate area. Even the aliens retreated—but only for a moment.

Suddenly, both were on the carcass. The commander shouted in surprise.

"Leave them alone." Lampan's voice was sharp.

The female reached into the body cavity. The humans watched in fascination as she drew out a living, squirming white creature and put it into one of her pouches. The male quickly spat a milky fluid in after it and held the pouch closed. His other hand never left her crest.

The strange couple repeated this process twelve times before backing away from the carcass in apparent disgust. The female settled on a patch of ground some distance away. Her crest seemed to have changed color under the male's constant caressess.

Andra wondered if she were watching something obscene, but dismissed the thought. So what if she were? It was essential to their species' survival.

Her attention was drawn by another 'copter coming over the horizon. Nobody else seemed to notice; they were transfixed by the aliens.

She approached Lampan and whispered, "Sir?"

"Yes. What?"

"There's a 'copter coming."

Lampan glanced back, saw it, and returned her stare. "Do you know what it is?"

"No. I thought you might."

The blades became audible. Reiken's eyes darted. He rasped to two of his men, who ran to flag down the craft.

Andra's attention returned to the female. She was shocked to see that she was in intense pain. Wisps of harsh vapor rose from each pouch, and the female had begun to make keening noises. Andra could feel the heat from two meters away.

"Can't you help her?" she begged Lampan. "Isn't there anything to stop the pain?"

"They have it under control," he answered tersely.

"But—"

"Be quiet, Andra."

His sharpness hurt her, but she complied. Quietly, she walked back to her father.

The first pouch had swelled considerably. It looked inflamed. Andra's skin tightened when the first infant emerged. The male caught it in one hand and gently laid it at the female's side.

The ritual continued for some time. Then something went wrong. The smoke from one of the pouches changed. The male opened it gently and brought out a stillborn infant. Both he and the female paused to examine it, but then they quickly went to the other pouches, placing the tiny body with its live siblings at the female's side.

Andra sobbed. She could just hear Sam, later, about this. Another lecture on female feelings. She turned to see

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if he'd noticed her, and was surprised to see that he and some of the others were struggling with the same emotion. Even Reiken looked sad.

The last pouch had just been emptied when three men appeared. One had translation headsets attached to a portable computer. Reiken ran to meet them.

Reiken waited with the headsets until the last infant was delivered. He hesitated, then approached the male, who had released the female's crest. The alien male seemed to understand what the commander wanted, and took headsets for himself and the female. Lampan took one set and spoke into the mouthpiece. The aliens seemed nonplussed. They adjusted their equipment. Finally recognition seemed to glint in their crimson eyes.

The male produced a series of sounds, which the computer echoed as, "The female and male thank you for your heat."

Lampan seemed surprised. "You didn't get a cultural program," he hissed to Reiken.

"A what?"

The scientist grunted. "You are welcome to our heat," he told the aliens. The stared. He tried again. "Our languages are very different. Please forgive if I do not know your manners."

"There will be goodwill beyond manners then," the female twittered. "The male does not understand this."

"That doesn't make sense," muttered Lampan.

"Tell them we're glad their babies are alive," suggested Reiken.

"We rejoice that your infants survive," Lampan told the female.

She managed to restrain her mate's urge to attack. The two removed the headsets and chattered. Then the female replaced hers.

"Male says to tell you my infants always survive. Dead one was unmothered before me. Not my fault."

"Oh, no," Lampan breathed, "I insulted her." To her he said, "Your motherhood is very good. To my kind, survival of an infant is very good."

"Female understands your meaning. Thank you. Your testicles are alive with sperm, you are virile, sexual father of many, I believe."

"Thank you," Lampan choked.

The conversation continued haltingly for some time. Andra couldn't help producing false coughs a number of times as matters of custom and form complicated things—usually to Lampan's embarrassment. However, by listening carefully she could figure out what was really being said. The gravity of it all sobered her.

For some reason the aliens' homeworld had become unlivable; why, Andra couldn't guess, since the creatures seemed to consider asking directly impolite. However, whatever had happened had taken some time. They had known their world was in trouble long enough to make provisions for their children.

Prior to the disaster, they hadn't made use of space travel beyond simple satellites and gadgetry for many generations. That was why their infants had been sent out in such simple ships. They had planned to intercept them for—as they termed it—"proper motherhood." Then something unexpected had delayed the adults' departure. The result

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was that many of the inferior ships had reached their destination—and crashed.

Andra guessed that the time crunch must have been incredible by the time the adults left. Why else would they put their young ones in such danger, except that it was less danger than staying home?

Lampan was sweating. "Do other adult females, males, survive on your homeworld?" he asked.

The female hesitated. "I will ignore the unpoliteness of question," the translater gibbered. "We cannot know. Homeworld is many—" gibberish; Andra guessed it was a unit of distance.

"Female and male thank you for giving child heat," the alien said unexpectedly. At that, they both turned their full attention on the infants at the female's side.

"Thank you," Lampan said into the translater. The aliens ignored him.

Lampan switched off the translater program. "Get a cultural program *immediately,*" he hissed to Reiken, "or they'll all hate us before we even find out what they call themselves. Assuming it isn't impolite to ask."

Things had been turning over in Andra's mind. They'd been home for several days, and everything was fine. The 'rines had been rounded up, matters had been settled with the stray boomerwhackers, and the aliens and their children seemed to be in good shape. Lampan had promised to come to dinner after things calmed down. Yet something still felt wrong to her mind.

Travis skulked at Andra's heels. He'd been a real pest since Mega became occupied with the pups. The smell of the soy bacon she was frying on the solar stove had brought him out this time.

"I should lock you out with the 'rines," she told the dog, stroking his head, "but I feel sorry for you." She sneaked him a strip of the artificial meat.

Beyond the yard the 'rines grazed in the usual scattered fashion. Some were lying under the rimrocks inside the parameters of the sonic barrier surrounding the ranch.

One of the turkens loudly announced the arrival of an egg.

"About time," Andra told the bird. She gently slipped the large, brown oval from the nest and cracked it into the hot pan.

Sam appeared, scratching his stomach, which protruded between his rumpled T-shirt and wrinkled trousers. His hair was considerably less tidy than his clothing.

Andra stifled a chuckle. "Good thing it's the female of our species that has to look good, Dad. You'd be in trouble otherwise."

"Who's to impress? No women around here."

She acknowledged his comment with a smirk, then turned the egg. Mega shook off the pups and came to investigate the delicious smells. Travis gave a warning bark to a 'rine that had wandered too close. Andra dodged both dogs as she carried the plates to the table.

"The dogs should be outside," grumbled Sam.

"I tried that, Dad, but it got cold. I couldn't leave Mega and the pups out

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there, and when I took them in, Travis about had a fit."

"Damn female maternal—"

"You've been doing that to me since I was a little girl, Dad," snapped Andra. "I don't like it."

"What? Joking about 'maternal feelings'? I'm just kidding."

"I know you are, but I don't like it. Those 'damn maternal feelings' are pretty damn important, Dad. They're the reason there are *people*, you know that?"

Sam stared at her over his half of the large egg, which was already getting cold. "All right. What brought that on?"

"I've been thinking about it since we got back. You know, I bet all those babies would have died if the female hadn't insisted on coming to save them."

"Yes . . ."

"You killed some of them."

"Now just a minute, young woman!"

"She *loves* them, Dad. Did you see the pain she went through to save them? All the damn male did was pat her on the back. About the way it is with people, isn't it—the female does all the bleeding and the work." She stabbed at her plate with her fork.

"Are you done yet?" Sam sighed.

"No, but I won't bother trying to tell *you*."

"Why? Because I'm a man?" Sam's eyes snapped in a way that made Andra listen. "What makes you think you know so much about children, Andra?"

Her face reddened. "When Mama died—"

"Your mother died when you were a very small child. You think I don't know how that affected you? Maybe you think I didn't raise you right?"

Andra stared.

"So you think men are insensitive and only women care about children? Well, that's not true!"

"Then why did you try to kill them, Dad? Why—"

"Why are you eating that egg?"

"I have to. We have to eat. It's just a dumb turken."

"What were those white blobs? How could I know? I knew they were dangerous—maybe even giant germs or parasites or something ghastly. I killed them because I had to protect *you*, daughter. Lampan understands that. The aliens understand that. The only one who doesn't seem to understand that is *you*. How the hell do you think I feel about that now that I know what they were?

"Men may not gestate babies, but by God they make sure they survive. I raised you. I had to protect you. Honey, I would have saved the alien babies if I could have. God, if I'd known . . ."

Sam shoved his plate aside and put his head down. His shoulders began to shake. "If I'd known. If I'd known how to find the mother you needed . . . you can't mail-order mothers, Andra. All these years later, and I still can't replace her. For you. For *me*."

Andra's gut went cold. And she'd been blaming him for trying to protect her, when he'd lost so much. The realization was like the passing of an eclipse, but painful, so painful.

She faltered for words. "Daddy—I guess I didn't know. I couldn't see past my own grief. Maybe I was blaming you for that, too." Her eyes stung. "It

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wasn't your fault that she died. And you *did* protect me. You didn't fail at all. You didn't, Dad, and—please, don't cry like that!"

"Stop being so angry at men, Andra. I couldn't give you everything. I'm only half your parents. I just had to do the best I could. That's how it always is. Do you think the alien female was the only one who cared? That 'male' you refer to was stroking the mother's crest to help her secrete the corrosives that helped the infants develop. He added his own enzymes to the pouches for the babies. He was also easing her pain, by the way, by massaging nerve centers in that crest. It really strikes me wrong that you think he was just spare baggage, Andra. You're eighteen years old and haven't known enough people, enough men, to make any real judgments about them—let *alone* about nonhumans!

"Do you know why the infants were sent out in such poor ships? Because a big part of being a parent is being afraid, Andra. The members of the race that wanted to save them panicked. The men *and* women of their race, Andra. They thought they wouldn't live to design better ships, so they did the best they could with their level of technology and hoped a more advanced race would know how to save them."

"I guess they did the best they could."

"Right."

There was a brief silence. Then, "Dad, why do men cover up so much? Not let their feelings show, I mean."

Sam actually chuckled—a relieved chuckle. "They do show their emotions were, some places, but this is a frontier planet. A lot depends on muscle. Men have more of that than you females. When you have to kill with your hands, you can't be blinded by tears. It doesn't matter how you feel about it. It just has to be done."

"So you kind of had to use your emotional muscle to kill the—the little white blobs." She consciously refused to call them babies.

Sam's eyes went hard. "Yes. I did."

"I think I understand. I had to kill that freak 'rine." She looked down. Her voice deepened. "I didn't like doing it. I never do."

They fell silent again. The weight of the conversation seemed to make the air thick. Then, suddenly, Travis jumped up. Alertness glinted in his eyes. He ran to the door and began barking furiously.

"Travis, what?" Andra looked to see the cause of his upset. Lampan was crossing the yard. "Oh, Travis, you dumb dog, shut up. He's a friend."

"Good watchdog," Lampan called amicably. "Very protective."

Andra smiled, first to her father, then to Lampan.

"He's in fine form," Sam agreed, "ever since the pups came along."

"I bet."

Andra picked up the dishes and kissed her father on the cheek. "Count on it. He is."

Sam just smiled. ■

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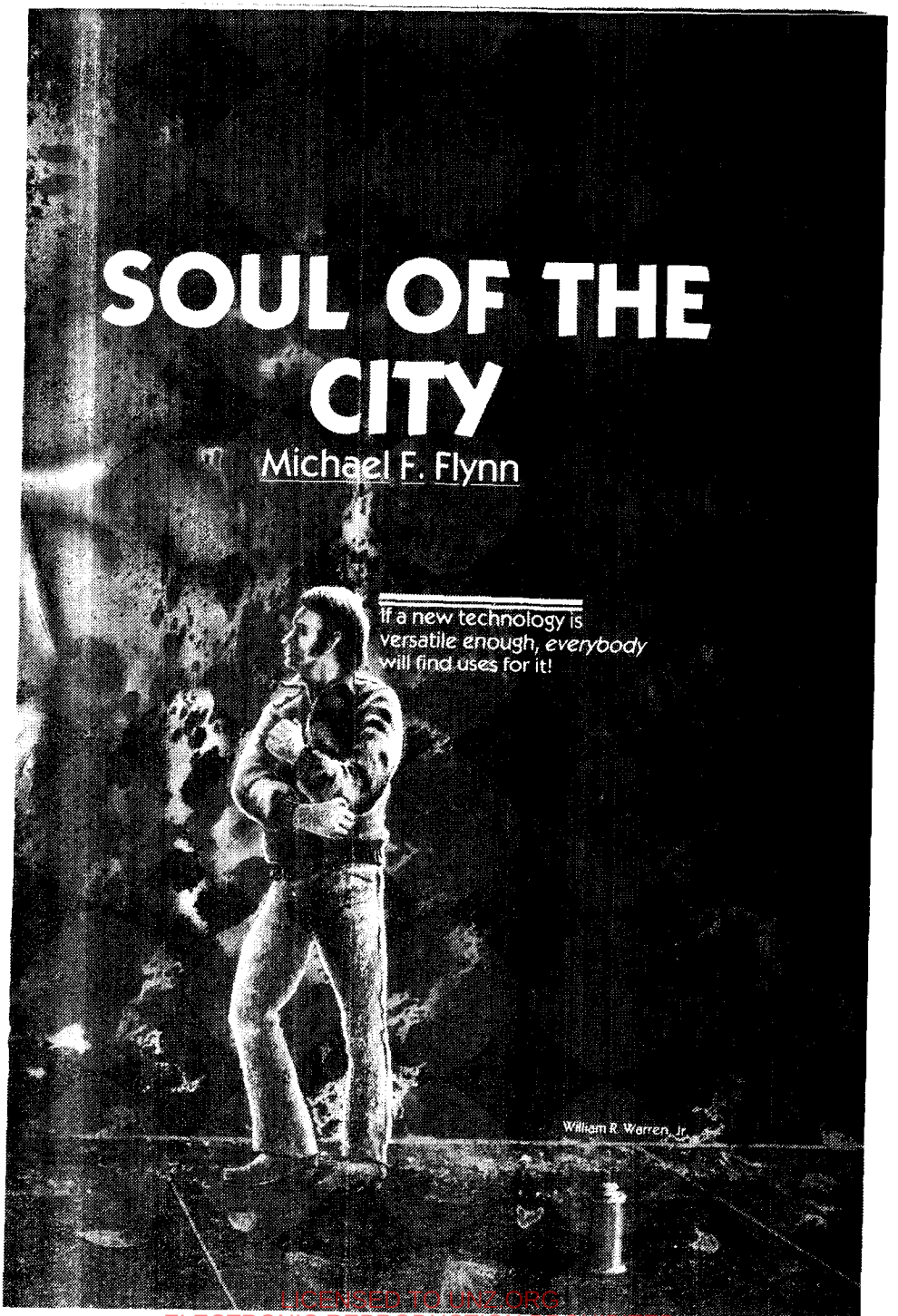
SOUL OF THE CITY
Michael F. Flynn
If a new technology is versatile enough, everybody will find uses for it!
William R. Warren, Jr.

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The blank, greystone wall was a canvas crying out for art, and Diego Salazar was the artist to rise to the occasion. He set his bag softly against the hard cement sidewalk, the cans within rattling, and studied the building in the harsh glare of the sodium vapor streetlights. He tried to feel how the building felt; the colors that would warm it; the shapes that would soften it. His brother, Jaime, and his friend, Pablo, stood watch at the two corners at the ends of the block, ready to whistle a warning should any cars approach. They fidgeted impatiently, knowing that speed was vital.

But Diego was not to be hurried. Sometime in the dim past he had been told of a famous architect—an Anglo, he could not remember the name—who had been hired to build a house on a certain hill. After several weeks had gone by, the owner had visited the site and found the architect sitting in the shade of a great tree, chewing upon a stem of grass, and admiring the view. Have you not begun upon my house, the builder cried? Have you not even sketched its floor plan? No, the architect had replied, for how can I design a house for this hillside until I know how it feels to be a house on this hillside?

Diego smiled as he remembered the story. That Anglo had understood. Diego liked to think that he and that man were soul brothers. That they would have recognized and understood each other immediately; knowing one another for artists. That, despite the gulf between a wealthy Anglo professional and a poor Dominican street artist, there would be a bond of *simpático*.

And yet, there was an urgency about Diego's work. Speed and timing were integral to his art; indeed, a part of it. The City Fathers, for whatever reason, did not approve of color and shape. They walled in the streets with hard, flat towers of granite and steel and glass; and in doing so, they walled in the souls of those who swarmed and toiled within. A breath of free thought, a soaring of the spirit, disturbed them. Why, place a mural before the swarming workers and, who knows? They might pause and admire it and be late for work. And so, artists like Diego worked by stealth, in the small hours of the morning.

A half-remembered story nibbled at the corner of his mind.

Suddenly, decision came upon him. He reached into his bag and pulled forth a spray can of bright crimson paint. Quickly, he set to work.

He worked swiftly and carefully, placing his colors and shapes just so, using an old piece of cardboard to mask his edges so the colors did not run together; using an old broom handle to steady his arm for the finer work.

The centerpiece of his creation was a two-word quote from that long-ago story. It cried out: "Repent, Harlequin!" in bold, explosive lettering, block shaped, but coming unravelled at the corners. Words unwilling to be confined by straight lines and angles. Behind the letterings and embracing it with outstretched arms, he sketched a jester's face thrown back in laughter, his cap o' bells cocked at a defiant, jaunty angle. The costume was straight pantomime: the motley that had graced a million English country Christmases. A cry from the long-suppressed, carefree heart of Anglo culture that belied the joyless exterior in which they had im-

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prisoned themselves. But the face he painted was the faces he knew: Brown skin. Narrow, oriental eyes. Straight, black Indian braids. Somehow, it all harmonized. Somehow it was exactly right.

When he was done, Diego stepped back and considered his work. It was flawed, as all such art is flawed. The dictates of speed meant that touch-up was not possible; that minor details went uncorrected. Still, he had to admit even to his own critical and seldom-satisfied eye, it was one of his best works. Better than the west support on the Williamsburg Bridge, now sadly sandblasted out of existence. Better even than last year's E-train (which had told a complete story, each car in line continuing the thread of narrative.) He dubbed his new painting The Unrepentant Harlequin. Simple and understated as it was in the garish and colorful vocabulary of his medium, the painting had captured the soul of the City. The clown, in his irrepressible, multi-ethnic gaiety seemed to burst outward from the flat, grey wall of the building, as the spirit of the people would burst from their grey, pinstriped suits, if only they were given the chance.

Hastily now, he stuffed his tools into his canvas bag and sprinted to the corner where Jaime waited. The paint cans rattled as he ran.

"Good, no?" he said to Jaime when he had arrived.

"It is wonderful," his little brother breathed. "Never have I seen so fine a painting."

Jaime was ten, and easily impressed. Still, Diego's chest swelled with pride at the compliment.

Pablo joined them. "Twenty-three minutes," he said, breathless. "A new record." Pablo was obsessed with numbers. He knew all the odds; he knew all the statistics. He worked in numbers the way Diego worked in spray paint. He paused and surveyed Diego's work. "You didn't finish it," he said. "Why?"

"What do you mean?"

Pablo pointed. "The lettering. You left it grey."

Diego looked and saw that, indeed, the lettering was grey, and not the bright, insistent red that he had used. "I don't understand," he said. And then he understood even less, because, as they watched, the other colors faded slowly and the drab walls of the building emerged, like mildew growing on a basement wall. Diego's heart faded with the colors.

Last to go were the jester's eyes and grin; and, as they vanished, they seemed to Diego to be, not a laughing affirmation of life, but that rictus of uncomprehending terror that the joyful have always worn when the life was sucked from them.

They sprinted to the wall and stared at it. It was as barren as the hearts of the City Fathers.

"Mother of God," said Pablo, crossing himself. "What magic is this?"

Diego knelt and fingered a trace of sooty powder at the foot of the wall. He rubbed it between thumb and fingers. It was gritty and slightly greasy and left a drab stain on his fingertips. The breeze down the canyon-like street caught the powder and it flashed away on the wind.

Diego gritted his teeth. "Not magic," he said. "Only another blow in the fight between the City and the street artists.

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They think they have found a way to proof their walls against our colors." He glanced down at Jaime, who was sniffling and rubbing his eye with a fist, crying for the now-vanished beauty.

"They think they have," he repeated.

He discovered the reason that very night. Diego was in the kitchenette, cooking supper for Jaime and his mother when he heard the word "graffiti" from the television set in the other room. He quickly turned the gas off on the stove, and hurried over to where the tube flickered in Jaime's face.

Mama, who worked nights, had woken and had turned on the evening news as a kind of backdrop to her primping. Diego sat on the floor next to Jaime and watched the screen carefully.

There were two men, both Anglos, standing before a clutch of microphones. The fat, jowly one was talking, while the other, a spare man with a brush cut and laughing eyes, stood a little behind and aside.

" . . . an end to this vandalism," the jowly man was saying.

"Could you explain for the folks at home how this chemical works?" asked one of the reporters. Since he worked for the station that Diego was watching, the camera cut quickly to show the reporter's face, looking wise and curious. Diego laughed, because he had once painted such a face on the wall of Black Rock, the NBC building. Only, he had painted the face as a masque, held before yearning cameras and phallic microphones. Behind the masque had been the same face, but with a bored and vapid expression. That work had lasted long enough to be photographed, and had appeared in full color in *City Magazine*. Diego still kept a clipping of that picture, the only permanent record of a sadly evanescent art form.

"I believe I'll let Dr. Singer answer that one," the fat man said.

The second man stepped to the microphones. "What Mr. Cardrick meant to say was that he doesn't know the answer." The reporters laughed at the sally, and even Cardrick chuckled unconvincingly. Diego took an immediate liking to the second man.

"I think you are all familiar," Singer said to the reporters, "with what a nanny is. A nanomachine is a machine built on a molecular scale. Proteins, viruses, and the like are natural, biological nanomachines. This new machine, which my Team and I have developed, is called EverKleen™. It is a clear, solar-powered coating that will protect buildings and windows—any reasonably flat surface—from picking up dirt and grime, thus eliminating the need for and the cost of periodic cleanings; not to mention the dangerous work of window-washers on the skyscrapers. When the nanny is sprayed onto a surface, its built-in nanocomputer, Tiny NIM®, memorizes the molecular structure underneath. Afterwards, anything applied overtop of it is recognized as foreign matter and the nanny's restrictor enzymes dismantle the molecules. Thus, the dirt or the bird droppings are converted into pure atoms of carbon, oxygen, and what-have-you."

"You say it destroys dirt," said a reporter who, being from a competing station, remained invisible and anonymous. (Instead, the director inserted a quick cut of his own man so the viewer

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would have the impression that it was he who had asked the question.) "Does it also recognize graffiti paint and destroy it, as Mr. Cardrick has claimed?"

Singer paused, pursed his lips, and nodded. "Yes."

"What about people leaning up against the building? Won't your nanny try to take them apart, too? Or at least their clothes?"

"Well, that would discourage loitering, wouldn't it?" said Singer. The reporters laughed again. "Seriously, though, we did give that considerable thought. Tiny NIM® has some built-in safeguards. For one thing, the coating doesn't act immediately. Depending on the thickness with which the coating is applied, the foreign material must remain in place anywhere from fifteen minutes to many hours. In fact, we can specify the thickness in minutes. Each layer of molecules is fifteen minutes 'thick.' Secondly, the foreign material must not move during that time. No person or animal can remain so perfectly still—on a molecular scale, let me remind you—even for a short time. So, birds are safe; birdshit is not."

The scene cut away from the press conference to the studio, where the anchor proceeded to tell the viewers what they had just heard. Diego didn't need the summary. He understood perfectly well what had happened. The City had a spray coating that ate art.

His hands clenched into fists. They couldn't do it! They couldn't take the color out of life! He wouldn't let them.

But how could he stop them? They would go through the City, painting over the graffiti or cleaning it off those places they wanted unpainted, and spray over the drab, monotone surfaces with their graffiti eater. Already, one building at least had been treated. Diego realized that now. The building he had tried to paint last night had probably been a test.

"Hah!" his mother said to his back. "You finished now with your spray cans, Diego. You finda job now, eh? You go t'work, like respectable people."

It was a long-standing argument. He didn't answer back, as he usually did, that he was an artist and artists lead different lives. He had a greater obstacle now than his mother's attempts to shoehorn him into some clock-punching, shuffling, ass-kissing office. His enemy was Cardrick, not his mother. Cardrick, who owned more buildings in the City than anyone. Cardrick was the enemy; not even, Diego realized suddenly, not even that scientist, Singer. No man with laughter in his eyes could be his enemy.

It came to him then what he had to do. He leapt to his feet and hurried to the telephone. He called Pablo. Pablo had a cousin who ran a Dominican restaurant on the Lower West Side. Its facade was grimy and scrawled with graffiti of no artistic merit at all. Only names and boasts and obscenities. Pablo's cousin would help.

They made it a public event, as Diego knew they would. There was no way Cardrick could allow such an open challenge to pass unanswered.

The building was new, unfinished. The wall was only partially painted and, hence, Diego had reasoned, unsprayed with the new material. Now it sported a giant mural, sprung into life in the

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small hours of the morning: The Unrepentant Harlequin laughed again. This time, the laugh was unabashedly triumphant. Diego had also added a little bit of Singer to the eyes. Not enough to be recognizable, but enough that Singer himself, when he made his appearance, gave a double-take and barely suppressed a grin.

Below the Harlequin, Diego had painted Cardrick. A pasty, joyless face the color of fishbellies, at once greedy and sorrowful, defeated by the laughter of the Harlequin. A comic book balloon emerged from the jester's lips: "Hey, nanny, nanny-o!"

Twice as large as its predecessor, the mural had required the help of seven other street artists to complete quickly enough to avoid being caught in the act. Yet, despite the committee approach, Diego was unable to detect where each of the artists had worked. They had followed his instructions and sketches perfectly; and he had paid them in what he knew would be the new coin of the demi-world of art.

Diego worked his way through to the front of the crowd, where he could see better. He kept his ear open for the comments and scattered remarks that he treasured. His morning-after reviews. "Seems a shame ta paint it over, don't it?" "That Cardrick, he ain't got no sensa humor." "Oh, I think it's rather funny, don't you, dear?" "Damn vandals gotta spray paint everything."

Well, no one loves a critic.

He reached the front of the crowd just as Cardrick began the press conference. Diego glanced at his watch and did some quick mental arithmetic. It would be close. He hoped Cardrick would hurry.

"This act of blatant vandalism," Cardrick humphed into the microphones that had been set up on a temporary platform, "is so obviously a challenge to our program, announced last week, of producing a graffiti-free City, that we felt a public response was called for." He waved a hand awkwardly at a small group of men and women dressed in green coveralls labelled "SingerLabs" across their shoulders. They wore goggles and air filters and pressure tanks strapped across their shoulders. "We will paint over this monstrosity," Cardrick continued, "this affront to the sensibilities of the people of our fair City, and prevent forever any future acts of vandalism."

Diego heard his name called. He glanced over his shoulder and saw Pablo pushing his way through the crowd. Pablo had Jaime and his cousin, Estebán, in tow. "I thought I would find you here," he said. "Best seat in the house, eh?"

Diego was growing more nervous as the time grew shorter. He cupped his hands about his mouth. "You gonna stan' up there an' talk, gringo? Or you gonna start painting?"

Cardrick stopped, surprised, in midsentence. He searched for the source of the interruption and glared. Singer, standing to one side, raised his eyebrows and looked at Diego speculatively. Cardrick waved an arm at the painters. "Go ahead. Paint the damn thing over."

Jaime looked crestfallen. "Diego, why did you do that? It only made them mad, so they ruin your picture."

"They were going to paint over it anyhow," Diego told him. Pablo, he

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saw, was biting his lip to keep from laughing.

The painting crew began spraying over the mural with a white basecoat. When they obliterated the Harlequin's head, a sigh ran through the crowd.

Diego saw that Singer's people were leaving Cardrick's visage for last. Little by little, they buried the mural under a layer of white until finally only the pasty, hangdog face remained. Singer, Diego realized as he watched Cardrick's scowl deepen, was something of an artist himself.

Finally, the cover-up was complete and Diego checked his watch. He breathed a sigh of relief. It was just in time. Oh, the exquisite agonies of the artist!

Cardrick launched into another speech, the gist of which was that when the basecoat had dried, the regular coat would be applied, then, after that, the EverKleen™. The crowd began to turn away. Watching paint dry was not a New Yorker's idea of excitement. Diego sighed, staring at the white spot where his mural had been.

Estebán was an older man, about forty. He took Diego's hand and pumped it vigorously. "I cannot thank you enough," he said, "for the fine job you and your friends did on my restaurant. Never has it looked so bright and clean. It draws in the customers, now, as naked women do the sailors. And your mural across the facade, your painting of *La Trinitaria* and their struggles against the black invaders—it is the talk of the neighborhood. Already the Haitian gang from across the street has tried to deface it; but their pitiful scrawls have faded, even as you said they would."

"It was the coating that man invented," Diego told him, pointing at Singer. "The one I had you buy."

"It was very expensive," Estebán said. "This Singer hombre charges dearly for his product. And to have it delivered by courier was even more so." Estebán shook his head.

"But it was worth it," Diego reminded him. "You will save in cleaning expenses far more than what you have paid out."

"Yes, as you said. It is not the price, but the cost that matters. Did you obtain the rebate?"

"Rebate?" Diego was paying Estebán only half a mind.

"Yes. I realize how easy it is to overestimate the amounts needed for a job; but I would hate to see you lose that money."

He spoke to the restauranteur without turning. "Oh, no. I did not want a rebate for the extra material. I wanted the material itself. This 'nanny' of Singer's."

"The material?" Estebán was puzzled. "Whatever for?"

"For my art. To pay my friends for their help. Because one layer of it is fifteen minutes thick," he replied.

Estebán turned in desperation to his cousin. "Pablo, he makes no sense."

Pablo was grinning. "He will."

A shout went up from the dispersing crowd. "The graffiti! It's back!" Heads turned. People stopped.

And indeed, while they stared at the wall, the white basecoat gradually faded and the laughing jester face returned. Repent, Harlequin, shouted the wall. Hey, nanny, nanny-o, the Harlequin replied.

Cardrick turned and saw what was

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happening and his face became mottled with surprise and anger. Singer had seen it, too, and after a moment of pure astonishment, was doing his best not to laugh. Instead, he approached the wall and touched it with an instrument he pulled from his pocket. He touched a few buttons on the face of the instrument, read the results. Then he did laugh, long and hard.

"What is it, Singer!" demanded Cardrick.

"I'm afraid someone has beaten you to it, Mr. Cardrick."

"Beaten me . . . What do you mean?"

"I mean someone painted this graffito, then covered it over with EverKleen™. The nanny now recognizes the paint film as the 'correct' surface and rejects anything applied overtop of it. Including your paint."

"What?! Do you mean to tell me that that piece of trash is—"

"Permanent? I think so. It will reject paint remover, certainly. We could sandblast, but the nanny layer would be dog's breath to bust through. We made it tough on purpose."

The crowd was laughing now. Some of them were slapping each other on the back. Some were pointing at Cardrick and Singer. Diego saw others run off and come running back with friends. Then they began to applaud. Slowly at first; only a few of them, rhythmic patter, like the first drops of a rainstorm. Then others joined in, and others, until it was a thunder in Diego's ears. Diego grinned widely enough to split his face in two.

Repent, Harlequin!

Never!

Jaime was jumping up and down and clapping his hands. "Diego! Aah, Diego," he said. Estebán was staring slack-jawed at the wall, the corners of his mouth twitching up. Pablo looked at Diego over his cousin's head. Diego stretched up his arm and tapped the crystal of his watch. How long?

Pablo looked at his own watch and held up a handful of fingers. Five more minutes. They waited the time out patiently.

When the Harlequin's left arm began to fade, the watching crowd let out a groan of disappointment. It rippled through their ranks like windblown paper down an alleyway. The disappointment was palpable. A patch of something that twinkled like cellophane fell away from the wall. The crowd sighed as the arm vanished.

Ah, but they loosed a cheer when it faded back in.

The new arm, painted beneath a second layer of EverKleen™ thirteen hours thick, had its thumb planted firmly against the jester's nose. Its fingers, caught in mid-waggle, danced contempt at the Cardrick-face. A tongue slowly appeared, lolling out from the jester's mouth. The crowd whooped and pointed at the property magnate, who grew steadily more angry.

Estebán leaned over to shout into Diego's ear. "I don't understand," he said. "What did you do?"

"We painted many paintings last night," Diego told him. "And covered each painting with a thick layer of the chemical. Then we painted overtop of it. The 'nanny' waits before it dissolves the material atop it. Depending on how thick it is laid on, it may wait many

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hours; even days. As each layer dissolves from the actions of the 'nanny' beneath it, it reveals the next level of painting. That was the tricky part, deciding how many coats of EverKleen™ to use for each layer. I was afraid the mural would start to change before Cardrick tried to cover it up; but the timing worked out very well, I think."

"I helped him calculate the timing," said Pablo. "The bottommost layers are many days thick, while the one on top was only fifteen minutes thick. You see, each layer had to be thinner than the one underneath it, otherwise, several layers of the painting might vanish at once."

"And that would be bad art," finished Diego.

Estebán grinned. "I like it," he said. "But what happens to the paint caught between the layers of the coating? It breaks down, you said; but where does it go?"

Diego shook his head. "Each layer of paint, except the very first, has a layer of EverKleen™ below it and above it. The outer layer of EverKleen™ bonds to the paint beneath it. When that paint dissolves from the inner layer of EverKleen™ it becomes a powder, and the upper layer, having no surface to bond to, simply falls away. What is left of the paint drops to the ground and becomes a pile of soot at the base of the wall."

Estebán smiled. "Have you become a chemist, now?"

"An artist learns how his medium performs. It takes no genius to realize that a coating does not outlast the surface it coats."

Estebán looked back at the mural. "How many layers of the painting are there?"

Diego shook his head. "That would be telling."

"People will come from all over the City to see this painting," Pablo announced, "hoping to be here when it changes again. Perhaps, even the City Fathers will grow to like it; or at least, to like the tourist money it will bring."

"Ah," Estebán sighed. "But you will gain nothing from it, Diego. That is not right."

"I am an artist," Diego told him. "And for me the art itself is sufficient."

The crowd was jostling around them, trying to get a better view, but Diego managed to maintain his place at the front. He leaned on the police barricade and admired his painting. A glance at his watch told him the next change was not due for several hours. He thought perhaps he would wait for it. Cardrick and Singer were arguing by the platform and Diego could make out some of the words. He heard "warranty" and "antidote." Finally, Cardrick turned in disgust and stalked off, tossing "lawyers" back over his shoulder at the scientist.

Singer watched him go, a twisted smile on his face. Then he turned and stared at the painting. Diego watched him pull a stick of gum from his shirt pocket and shove it into his mouth. After a while he turned away from the painting, and Diego saw the thoughtful look on his face.

Singer called one of his people over, someone named Eamonn; and began talking with him in low, excited tones. Diego heard him say something about "Belusov's Reaction." The skinny, freckled man he was talking to looked

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at the mural, thought for a moment, and nodded vigorously. He grinned and Singer slapped him on the back and they parted. Singer glanced at his watch and again at the painting.

Somehow, Diego knew without asking what Singer was thinking. Timed paint. Colors that would evaporate and change with subtlety and precision. Diego's heart beat faster. He had painted in space for many years. Now he could paint in time, as well. Painting in time. There was a new art, for you. How he longed to express himself in it!

As Singer turned to go, he caught sight of Diego. Their eyes met and locked for a moment. Singer looked from Diego to the painting, then at the way Diego looked at the painting. Then he grunted and shook his head slowly, and Diego smiled bashfully back at him.

Slowly, a grin spread over Singer's face. He gave Diego a cocky salute and, after a moment, Diego gave him an equally cocky bow. They recognized and understood each other perfectly. Artists always did. ■

IN TIMES TO COME

● Our March cover, by Nick Jainschigg, is for Harry Turtledove's "Nothing in the Night-Time," another of his vivid stories of exploration of new worlds and contact and commerce with new species. In this case, commerce with one species is no problem (relatively speaking), but hanging over it is the shadow of another species said to have existed in the past, which may or may not have something to do with a big problem faced by the present alien traders. How can a species long extinct be causing trouble in the present? Well, consider the old saying, "Absence of evidence is not evidence of absence." Sometimes even that is an understatement. . . .

Next month's issue will also feature a peculiarly striking novelette, "Humanity Test," by Charles Sheffield, and stories by a variety of other authors including Michael F. Flynn, Geoffrey A. Landis, and Rick Shelley. Plus the usual fact article, this time by Donald F. Robertson concerning imminent Soviet activities on Mars, and a short report by Ben Bova and G. Harry Stine on a real experiment in global communications that you may have watched (or even participated in) a year or so back.

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The Alternate View

SUPERNOVA DUDS AND TOOTHPASTE

John G. Cramer

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The biggest astrophysical event of the century occurred in February of 1987, when Supernova 1987A flashed into the skies of the southern hemisphere. This rare event, the first supernova in our galactic neighborhood since the invention of the telescope, gave astrophysicists a relatively close-up look at a supernova. A class B3 blue supergiant star only 160,000 light years distant had run out of nuclear fuel, gone into gravitational collapse, and exploded. The event was carefully studied in the infrared, visible, and ultraviolet regions of the electromagnetic spectrum. Neutrinos from the supernova's core collapse were detected by large underground detectors in Ohio and Japan. (See my AV column "SN1987A—Supernova Astrophysics Grows Up" in the December 1987 *Analog*.)

SN1987A also brought into focus *the* central problem of supernova astrophysics: that massive stars explode far more readily in the real universe than they do in the simulated world within large computers. Computer models are used by astrophysicists to test their understanding of how a supernova works. Within such models supernovas either refuse to explode or do so with great reluctance.

A computer model is a program into which is coded all the physics that we know that is relevant to supernovas: how the matter in stars behave under the extremes of temperature and pressure that occur during a supernova, how shock waves form and propagate, how energy is transferred from one form to another, how nuclear reactions work in stars, etc. While the computer clock ticks, the explosion is initiated and proceeds, step by step.

The star, in its deep interior furnace where there is enormous pressure and temperature, has been producing energy by fusing hydrogen into helium, helium into carbon, carbon into oxygen, oxygen into neon, and so on, until it has accumulated a dominant "ash" of the nucleus iron–56. Iron-56 lies at the very peak of the curve of binding energy, and is therefore the most stable of nuclei. A star cannot burn iron in any nuclear fusion reaction to extract more energy. Iron is the bottom of the energy barrel.

When the fusion reactor at the star's core becomes saturated with iron, it has a "flameout." The nuclear reactions grind to a halt. Up to this point a delicate equilibrium has been maintained between the force of gravity which pulls the stellar matter inward, and nuclear heating which pushes the stellar gases outward. When the nuclear furnace switches off, gravity takes over. The matter of the star falls inward toward the core in near free fall, and the star collapses.

There is an enormous quantity of en-

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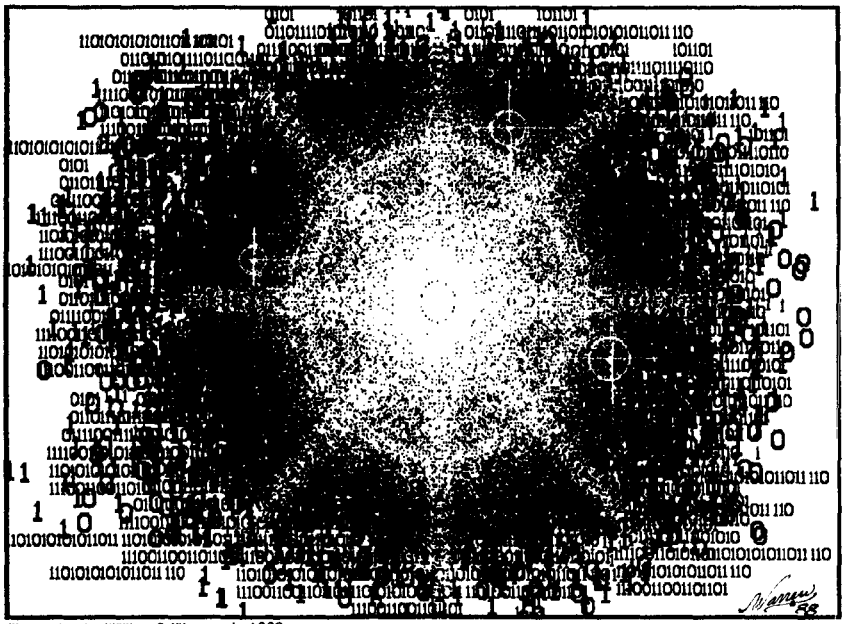

Illustration by William R. Warren, Jr. 1989

ergy liberated in this in-fall, the gravitational potential energy that had been stored in the outer "uphill" parts of the star. The star matter falls inward faster and faster, and the density of atoms in a given volume rises higher and higher. This goes on until the interior of the star hits a sort of brick wall. When the matter reaches a density about that of a nucleus, the strong nuclear force begins to act to resist further compression. Like a tennis ball hitting a solid wall, the infalling matter literally bounces. An outgoing shock wave forms and begins propagating outward, carrying a fraction of the gravitational energy from the in-fall back to the surface of the star where it can blow off the outer layers and make the supernova explosion.

All of these processes are modelled in the computer, and up to this point, every thing looks very supernova-like. But then a problem occurs. As the shock wave propagates outward, it encounters the infalling matter streaming through it in the opposite direction. When the shock wave reaches a certain radius, it stalls.

Its outward movement is halted because the speed of the in-fall has matched the outward speed of the shock wave. The shock wave then "runs in place," moving through new matter not because it is moving outward, but because the matter is moving inward through it. The shock wave gives its energy to the matter moving through it, and finally dissipates. And so, in the computer, the explosion never happens. The violent supernova explosion has, in the computer simulation, become a quiet self-contained burp. Nature can make su-

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pernovas, but for a while we were only making duds in the computer.

This problem, the non-explosion of supernovas in computer models, caused a careful reexamination of all the physical processes that are included in the models. It was soon realized that processes involving neutrinos can help solve the problem. When the central part of the collapsing star reaches nuclear density, it becomes energetically favorable for a proton to eat a nearby electron and spit out a neutrino. The proton then becomes electrically neutral and the electrical repulsion which had been pushing it to a higher energy state goes away. The exploding star develops a neutron-star at its core, and a flood of neutrinos, one for each new neutron, stream outward. A very large number of neutrinos are produced in this way. SN1987A probably produced 10^{58} of them. When they reach the stalled shock wave they can boost it with a flood of new energy from the core collapse.

Neutrinos are very inert as particles go. Electrically neutral, weakly interacting, and with a rest mass at or near zero, a typical supernova neutrino could pass through a light-year of lead without scattering from even one atom of lead. But the out-streaming neutrinos from a supernova must travel through an amount of matter equivalent to a *few thousand* light-years of lead at normal density.

Neutrinos are thought to lose about 1% of this energy by scatterings on their way out of the star. The neutrinos from the core collapse carry 100 times more energy than what goes into the blast shock wave, and the shock wave carries 100 times more energy than ever emerges as visible light. The light from the supernova, which can outshine whole galaxies, is a minor side-effect of the explosion.

When the neutral weak current processes that allow neutrinos to scatter were first discovered, it was thought that the secret of the supernova explosion had been found, that the elastic scattering of the neutrinos would provide enough push to restart the shock wave and allow the supernova to explode within the computer as well as in the heavens. As it turned out, this extra push is not quite enough. When the effect of neutrino scattering was included in the computer programs the shock waves could, by making extreme assumptions, be restarted and explosions generated.

But the results were too close to the edge of the parameter ranges to be completely plausible, and the explosions generated by the simulations did not bear enough resemblance to observed supernovas in distant galaxies. The consensus among astrophysicists was that a piece of physics was still missing from the computer models, that the last piece of the puzzle had not yet been found.

The missing puzzle piece may have just been discovered. All nuclei have an excitation mode, a way of containing internal energy by vibration, that is called a "giant resonance." In a giant resonance vibration the neutrons slosh in one direction in the nucleus, while the protons slosh the other way, moving the net electric charge of the nucleus back and forth while leaving the center of mass of the nucleus undisturbed. It was recently realized that neutrinos scattering from the nucleus can trigger this vibration, leaving a sizable fraction of

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their energy in the nucleus as they do so.

This new piece of physics had not been included in the computer models. It was discovered recently by Profs. Wick Haxton of the University of Washington and Stan Woosley of the University of California at Santa Cruz. Calculations including this mechanism have not yet been performed, but when they are included there is optimism that this process will boost the energy and momentum transferred from the neutrinos to the shock wave and help to produce more realistic supernova explosions in the simulations. And the neutrino excitations of giant resonances also has another interesting consequence.

The high abundance of element fluorine has been an astrophysical mystery for some time. Astrophysicists can now account for the formation of most of the elements in the periodic table. The lightest elements, hydrogen through lithium, were synthesized in the early stages of the Big Bang. The elements from beryllium through iron were "slow-cooked" in stars during the nuclear burning mentioned earlier. The heaviest elements, from cobalt to uranium, were "flash-fried" during supernovas of the early first generation stars, with elements repeatedly capturing neutrons streaming away from the center of the explosion, until the force of the explosion finally blasted the newly-made heavy elements into space to be recaptured into metal-rich second generation stars like our sun. The chemical elements of our bodies were cooked in the violence of the Big Bang, in the superhot furnaces of large early stars, and in the blasts of supernovas.

This scenario of element formation works well, and the present abundances of most of the elements in the periodic table can be accounted for with detailed calculations based on this picture. But the only stable isotope of fluorine, fluorine-19, doesn't fit. It cannot be directly made by fusing several heliums together. It should be very rare, but it is only 3,000 times less abundant than the element neon, which is easily produced by fusing helium and oxygen. It is also far more abundant than the lighter elements lithium, beryllium and boron. No theory of element formation has ever been able to account for the fluorine-to-neon ratio that we find in the universe.

The Haxton-Woosley mechanism may solve this problem, too. The abundant neon-20 isotope in the outer parts of the exploding star has a high probability of being kicked into a giant-resonance vibration by the out-streaming neutrinos. When this happens, the neon nucleus is very likely to spit out a neutron or proton as a way of carrying away its excess energy. If a proton is thrown off, the stable isotope fluorine-19 is left behind. If a neutron is evaporated, the isotope neon-19 results. But neon-19 is radioactive and will rapidly decay into fluorine-19. Thus, both processes contribute to the formation of fluorine-19 during a supernova. Calculations by Haxton and Woosley just predict the observed 1/3,000 fluorine-to-neon ratio.

What are the consequences of this? One science reporter has suggested that this might be nature's way of fighting tooth decay, by arranging for fluorine to form in supernovas so that it could

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be used in toothpaste. That's an interesting hypothesis, but I'm afraid it seems a bit far-fetched even for a science fiction magazine, doesn't it? ■

REFERENCE

S. E. Woosley and W. C. Haxton *Nature 334*, 45 (July 7, 1988).

●"In ancient days two aviators procured to themselves wings. Daedalus flew safely through the middle air and was duly honored on his landing. Icarus soared upwards toward the sun till the wax melted which bound his wings and his flight ended in fiasco. . . . The classical authorities tell us, of course, that he was only "doing a stunt"; but I prefer to think of him as the man who brought to light a serious constructional defect in the flying-machines of his day. So, too, in science. Cautious Daedalus will apply his theories where he feels they will safely go; but by his excess of caution their hidden weaknesses remain undiscovered. Icarus will strain his theories to the breaking-point till the weak joints gape. For mere adventure? Perhaps partly, that is human nature. But if he is destined not yet to reach the sun and solve the riddle of its construction, we may at least hope to learn from this journey some hints to build a better machine."

Sir Arthur Eddington, 1927

●"Those who dare are often disappointed, sometimes crushed. But without challenge, life withers. Icarus dared to accept the challenge; so do we his, his offspring."

Ben Bova

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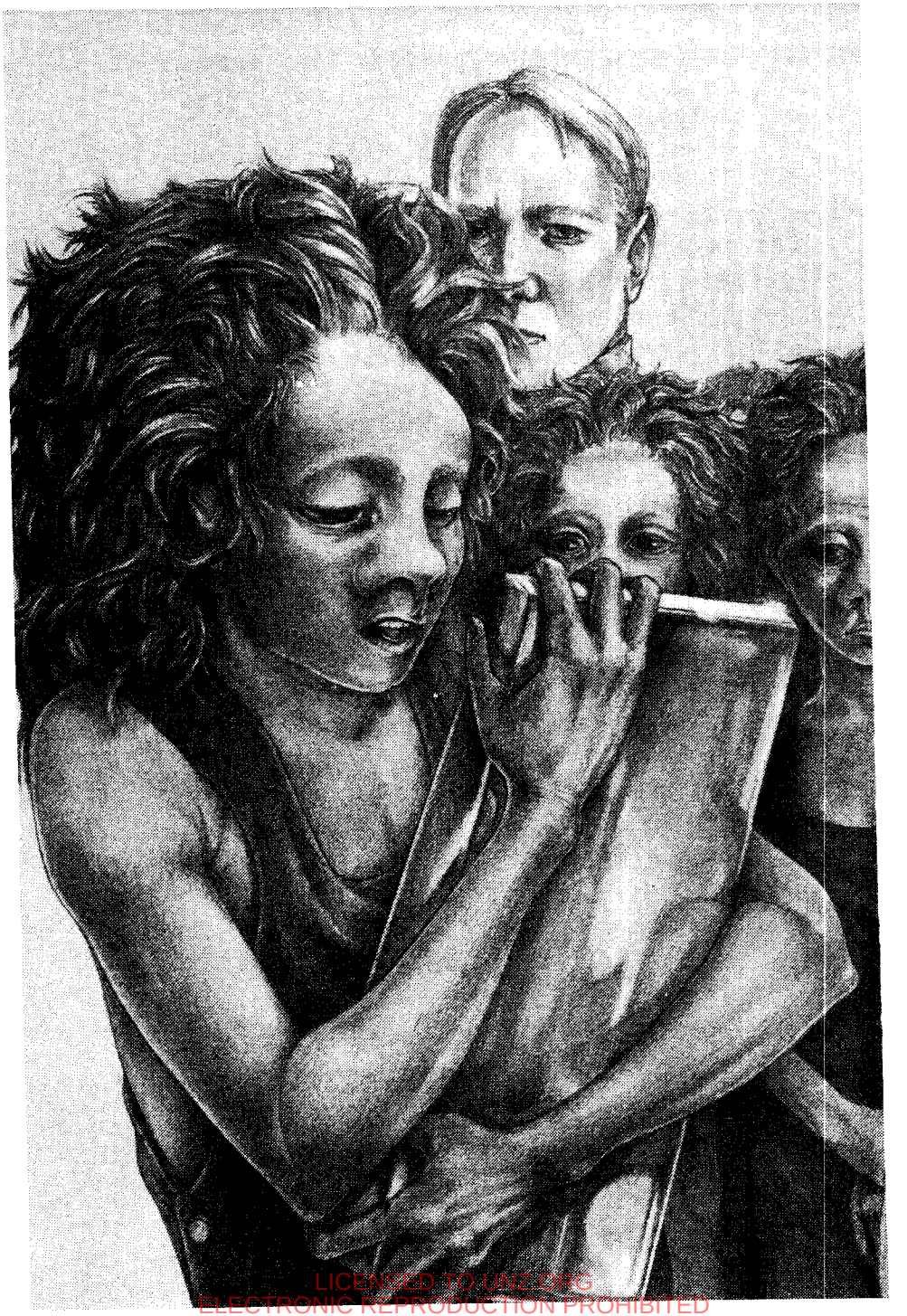

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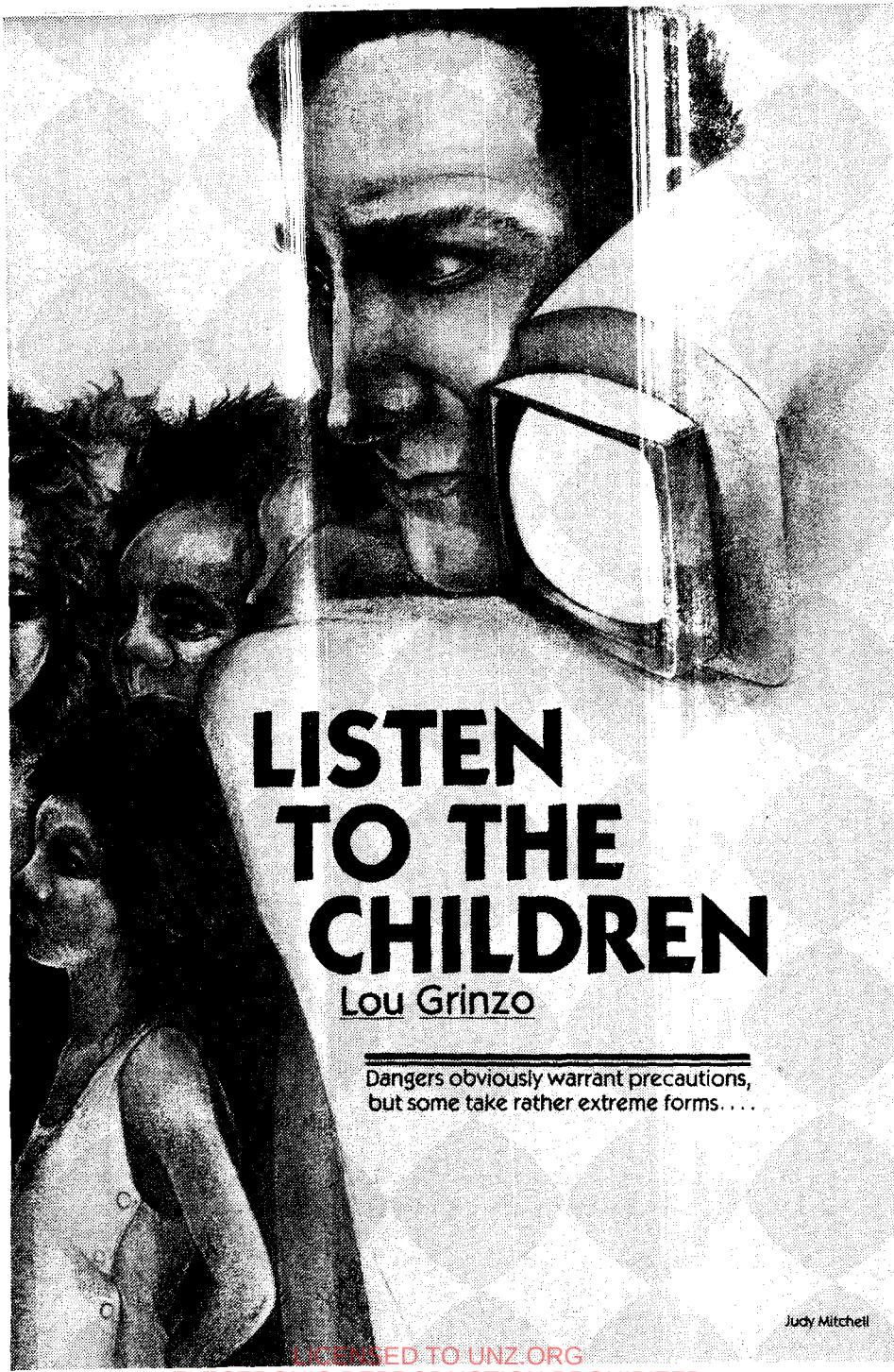

LISTEN TO THE CHILDREN

Lou Grinzo

Dangers obviously warrant precautions, but some take rather extreme forms. . . .

Judy Mitchell

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Miranda was a beautiful planet. It was slightly larger than Earth, with four large continents and the bluest oceans any human had ever seen. White clouds obstructed much of the view from orbit, but no one on the *Nebraska* complained. Here at last was a perfect world, one that would need no arduous terraforming to be suitable for human life. The pristine state of Miranda was itself enough to pull at the heart of anyone who'd recently been to Earth; the mother planet's population had swollen to 32 billion humans and there were four major uninhabitable zones of radioactivity.

Faran Galway continued to gaze out the window at Miranda and ignore the conversation in the rec room. Paradise, he thought. That's what we should have named it. Or Eden, or Camelot. Something romantic, something that had an air of joy about it. This planet needs a name that embodies the thankfulness of mankind for finding such a gem. But the people who decided such things insisted on naming this planet, at least temporarily, after the lucky crewman who first discovered its special characteristics.

The sole problem with Miranda was that it was already inhabited.

Of all the planets man had previously explored, none were home to intelligent life. Only three had any form of life at all, and two of those were populated with microbes that only biologists found exciting. The third planet was home to some primitive flora and a tiny slug-like creature. The excitement over that discovery didn't last very long; scientists were still searching that planet for something interesting.

But Miranda presented a much different situation. Here was a planet with an obviously intelligent race. Telescopes revealed that the individuals were well under two meters in height, bipedal, and had two arms. They had three fingers with an opposable thumb on each hand, and a long mane of bright red hair, except for the older individuals, who apparently tended toward baldness. Their skin was a waxy grey, and they had large, pleading eyes. The entire population—tens of thousands of individuals—lived in one large city. Their society appeared to be very primitive by human standards, but they clearly were an advanced life form. A crew would be sent down to the planet, to study them, to make man's long-awaited first contact with an alien race. To find out, Galway realized bitterly, how much of a fight they'll put up to keep their planet.

"Hey, Faran, would you mind paying a little attention?"

He turned away from the window and picked out Lesane, the man who'd broken his concentration. "Sure, Ruby. Now what are the big boys trying to tell us?"

"More stuff about what we might run into down there." Ruby didn't look away from the screen as he answered. He and the other two men studying for the mission, Jak Hallis and Shen Miranda, were viewing the most recent lesson relayed by Sagan Station, the self-sufficient deep space station closest to Miranda. This presentation was yet another lecture on the interactions between primitive and advanced cultures. The authorities and the company insisted on making them continue with this crash course, since none of them were experts in the right fields.

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He watched the speaker's familiar face for a moment. This gray-haired man with the razor-sharp goatee had been lecturing them for weeks. Galway couldn't understand how the others were putting up with it so diligently. What could these so-called experts possibly teach them? He turned back to the window, and wondered how many of the aliens would die by the time man lived on Miranda.

Later that day, the results from the atmosphere probe were released to the crew. Miranda's atmosphere was very close to Earth's, and no harmful substances or microbes were detected. At the same time it was announced that the landing party would consist of only two men, Galway and Lesane, with Galway in charge. Shen Miranda would not be part of the mission on "his" planet.

A few hours after the announcements, Galway was summoned to Captain Bilstein's compartment. Bilstein was an overweight, balding, middle-aged man who was nearing retirement, and was quite satisfied to follow orders to the letter. "Galway, the company wants to make sure there are no screw-ups on this little excursion. They've given me specific instructions about how I'm supposed to handle the mission records. You're going to record everything that happens down there, and I mean *everything*. We'll stage it all here on *Nebraska*. Once the mission is over, we'll contact the big boys at Sagan Station and give them a summary. We're supposed to wait for their OK before the rest is sent on unencrypted packet-beam."

"Wait a minute—that doesn't make sense. Every human alive must be dying to find out what happens down there, and they're going to delay it several more days? Why?"

"They made it very clear that these are the rules we play by. There's a lot riding on what you guys discover down there. Just look at that planet, son! They say the big question is whether these aliens are really sentient or not. The governments on Earth know about our situation by now, and they want more information. There's a lot to be done, depending on what you find out."

" 'A lot to be done.' I bet. Are we going to just slaughter these aliens and take Miranda if they're not up to our standards of sentience?" He winced at the edge he heard in Galway's voice, but it was too late to do anything about it.

"Take it easy, Galway. If these guys check out, then we're going to leave them alone. Yeah, there'll be lots of missions that'll come here to study them, and maybe even do a little trading, but that's all. So calm down."

"I *do* understand what you're saying," Galway said, with more control. "But what I don't understand is why this mission is needed to answer that question. No great decision should be hanging in the balance. These aliens, these *people*, live in a city, they wear clothing! What more do you want from them? Space flight?"

"Look, I don't pretend to understand all this stuff. The big boys tell me that it's very complex, and that spending a few days down there is the only way to know for sure. All I'm saying is that the psych profiles tell us that you and Lesane are the best people available for this job. The decision has been made

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to send only two of you down, just in case there's some kind of environmental hazard we didn't pick up." Bilstein stared intensely and leaned forward, placing his elbows on the desk. His tone deepened expertly. "I want you to go down there . . . and do the best you can. Everything else is out of our hands. OK?"

The landing craft they used was designed to accommodate twenty people. Most of the seats had been removed, and the space was filled with crude living accommodations, and food and equipment. They touched down in what Galway hoped was just an open field, and not some sort of sacred burial ground, or worse, about a mile from the city. As soon as they reported in to the *Nebraska* that everything was all right, Galway approached Lesane with his concern.

"Ruby, we've got to get something straight here. Bilstein couldn't see what's going on if his life depended on it. He's about to help the company take Miranda away from these aliens."

"Are you sure?" Lesane frowned.

"I don't have any hard proof, if that's what you mean. But look at how this mission is being run. And think about what this planet would mean to mankind, even at this distance from Earth. Do you really think that the company and the governments back home will pass up an easy opportunity to grab it?" His words sounded paranoid in his mind, like the echo of a bad dream. I hope I'm fighting something that's really there, he thought.

"I've been thinking about that, too. What can we do about it? The odds aren't exactly in our favor."

Outside the ship, they started walking towards the city. Almost immediately, they spotted a single alien walking towards them.

"Well, looks like the welcome wagon knows we're here," Lesane said excitedly.

"Take it easy," Galway said quietly. "We've got to stay calm. Got the camera going?" Lesane made an affirmative sound. Galway took a deep calming breath and said, "OK, let's do it."

When they came face to face with the alien, Galway was surprised. He looked just like the aliens viewed with the telescope, including the simple dark blue overalls he wore, the sandals, the explosion of bright red hair, and the light grey skin. The alien's eyes were large and emerald green, with horizontal pupils.

Lesane kept the camera on the alien, then stepped to the side to get a profile of the two of them. Galway stood there awkwardly for a moment, then impulsively held out one hand.

The alien stared at Galway with a completely blank expression, then slowly turned his head to stare at Lesane. Suddenly, in a stunning baritone he said, "K'thaluh! Nashak fressa k'peej!" He turned and started walking back towards the city in a fast gait.

Galway stood there with his hand outstretched, blinking stupidly at the retreating alien's back. Lesane broke into howls of laughter and almost dropped the camera. After he recovered, he said, "Looks like we don't have to worry about them worshiping us."

They ran after the alien. When they

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caught up with him, they unsuccessfully tried to get him to stand still. They needed to start building the translator's alien vocabulary as soon as possible, but their host wasn't cooperating. They did the only thing they could. They followed him.

The city was spread across a large hillside overlooking a wide, slow-moving river. The buildings were mostly small squarish structures, large enough for a few small rooms, at most. Scattered amongst these buildings were several large, round ones. They were all made of large beige blocks, and had black roofs. There was no obvious pattern to their arrangement. The streets were all unpaved. Between the buildings and the river there was a broad, flat section of land that had been turned into a park full of benches and shade trees with dark red and green leaves.

As they approached, they saw quite a few other aliens. None of them seemed surprised at the sight of a couple of humans in their midst. A wave of sound caught their attention, and they saw a large group of young alien children, each carrying a pair of tiny silver bells and wearing brilliantly colored overalls, running through the park. They swirled and blended around admiring pedestrians and trees and benches like giant pieces of windblown confetti.

The alien selected a granite colored stone bench near the middle of the park, and sat, placing his hands on his knees. He looked up at the humans calmly. The men looked around, looked at each other, and decided the spot was as good as any for the language course. Lesane unfolded a small tripod and set up the camera to record the affair before sitting down.

They spent several hours feeding the translator alien vocabulary and what they hoped was the proper English translation. The machine automatically recorded and analyzed sentence structure. The first time the computer translated a short sentence, the alien stared intently at the small box. The men held their breath as a smile slowly appeared on the alien's face. They were very relieved to see their technology accepted so calmly.

They continued on in this way for a while, and found out that their host's name was Jirbathne-M'sed, which they shortened to "Jerry." Jerry's race referred to itself as "the Children." After a while, the computer had just enough of the alien language worked out that it could handle simple question and answer exchanges, although it was still using a crude version of the language full of grammatical errors. Occasionally, the translator would have to break into a separate conversation with Jerry, to find out what a particular word meant, or to ask him for the word for a concept it didn't know how to translate.

"Jerry, are you a leader of your people?" Galway asked.

"No, we have no leaders. I was merely the first adult to see your skyboat come down. I came to greet you, and act as your ambassador." The translator had resorted to another brief conversation with Jerry to understand the Children word it interpreted as "ambassador."

"Do the Children have a religion?"

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The computer produced a very long stream of language.

"We have only The Truth. That is how we knew you were coming." He hmpfed and smiled at them. Galway noticed the mannerism and was surprised at how satisfied the alien seemed with himself.

"Wait a minute!" Lesane cut in. "How could you possibly *know* we were coming?" Galway put one hand on Lesane's shoulder, and made a calming motion with the other.

"We did not know exactly when you would arrive, but The Truth tells us that some day gods, different from the Creators, would arrive, and that we should trust you and treat you with kindness, and that you would not harm us."

"Oh, boy." Lesane said under his breath. "Here we go."

"But Jerry, you see that we're not gods, don't you? We're just flesh and blood beings, like Children." Galway found himself trying desperately to remember snippets of things the man with the goatee had said.

"Yes, of course you are made of flesh and blood. How else would gods be made?" Jerry was no longer smiling contentedly.

"Well, there are civilizations that believe that their god or gods are similar to humans, but don't really have physical bodies. And they have mysterious powers."

"Yes, I understand." Jerry reached out a boney finger and gently tapped the translator.

"No, this is just a machine, a tool. It doesn't make us gods."

"I understand. The Truth warned us that when you came, you would deny being gods. You would try not to frighten us. Do not worry, we are not frightened."

"Where did The Truth come from, Jerry? Your Creators?"

"Of course. It is taught to all our children, and guides us throughout life. Surely gods such as you know of The Truth."

"No, we don't know of your Truth. We come from very far away, and we have our own Truth, different from yours. Please tell us about yours."

"There is nothing to tell. The Truth is everything. It leads us in our lives. It tells us everything we need to know—how to grow food, educate our children, make clothing, repair our homes, care for our sick. It told us that you were coming, and here you are. The Truth lives." Jerry hmpfed and smiled.

Galway pressed the mute button on the translator, and turned to Lesane. He hoped the Children didn't take deep offense at being excluded so rudely from a conversation. "Now what? I don't know where to go with this."

Lesane rolled his eyes and sighed. "Why don't they have more than one city?"

Galway released the button. "How many people live in your city?"

Jerry immediately replied, "Less than 65,536, of course. That is according to The Truth. The Truth lives."

Galway looked at Lesane and whispered, "Remember, they work in base eight. That's what—two hundred thousand in their numbering system." He turned back to Jerry. "Is that why you have only one city? Because The Truth says you should never have more than 65,536 people?"

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"That is correct. We only have enough children to keep our population near that number."

Lesane couldn't help himself. "But don't you people explore? Aren't you curious about the world?"

"We don't explore because The Truth tells us that we should live only in this city. There is nothing else we need. The Truth lives."

Lesane looked at Galway and shrugged a helpless, frustrated shrug. He looked at Jerry and asked, "How long have you lived in this city?"

"The Children have lived here since the Creators came from the sky and made the world for us."

"And how long is that?"

"147,383 years."

Lesane silenced the translator. "Are we sure we've got the time conversions right? Can their civilization really be that old?"

More questions and answers were exchanged, and Jerry wound up explaining the Children's timekeeping system in painful detail for the second time. They quickly reached the conclusion that the translator did understand the time units properly, and that the Children as a race were indeed nearly 150,000 years old.

Galway looked around for something less remarkable to talk about, and spotted an excavation operation about 100 yards away from where they sat. A group of adults was digging a hole about three meters in diameter. He motioned to the workers. "What's going on over there? Anything interesting?"

"Yes, something very interesting. Once we saw that your skyboat was indeed the coming of other gods, we had to start digging. That's where the Book of the Creators is located." Jerry hmpfed and smiled again, looking even more pleased with himself than before.

"I don't know what the Book of the Creators is. Please explain." Galway glanced sideways at Lesane and felt a tightness in his throat.

"It is the book that we are to dig up and present to you. It was written by the Creators. It is my job as ambassador to read it to you. The Truth lives."

"There's a book down there from the Creators, and you've never dug it up? Why?" An intelligent race without curiosity, Galway thought. Could that be possible?

"Because The Truth tells us that it is meant for you. It instructed us to wait for your arrival. You are here now, so we are digging. It will take some time for the workers to reach it. The Truth tells us that the Book of the Creators is buried eleven meters deep."

"But how did you know exactly where to dig?"

"When the Creators laid out our city, they left a large stone marker in the park designating the spot where the Book was buried. One of our jobs is to make sure that the stone is never covered with dirt and plants. It is the same in your Truth, is it not?"

"No, our Truth is different. Very different."

Galway and Lesane reached for the mute button at the same time. "Well," Galway started, "the way I figure it, the Children are either the result of a collapsed society that somehow never rose again, or they've had alien visitors in the past who tried to manipulate them and at least partially succeeded."

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"Or maybe they've just got one hell of a weird religion. OK, you're probably right, Faran. It sure looks like there's some external influence on them. That would certainly explain some of the oddities, in a weird sort of way.

"The main thing I don't understand is that business about their population. With a whole planet to live on, why would anyone tell them to keep their numbers so low?"

"Maybe so they wouldn't misplace the Book of the Creators?"

Galway reactivated the translator, and turned back to Jerry, who was patiently waiting for the two gods to finish their private conversation.

"Jerry, we're going back to our ship now. We'll return in the morning." Galway said. Jerry smiled a little at him and said, "I will pray about you," then rose and walked away, heading for the hillside of buildings behind them.

"Pray *about* us?" Lesane asked.

"Beats me," Galway said absently. "Maybe it's a local expression."

On the walk back to the ship, both men were silent. At first, Galway assumed it was because they were tired, worn out from the mental effort. But it was more than that. The feeling of adventure, of the historic importance of what they were doing was thick about them like a heavy fog. The whole episode was humbling.

At the ship, Lesane immediately stripped down to his shorts and stretched out on one of the bunks. Galway put in a radio call to Bilstein on the *Nebraska*. It took a few minutes for the captain to get to the radio, and he looked tired when he appeared on Galway's screen.

"Nice job you boys are doing down there, Galway. Everyone back home will be impressed with the way you guys have handled yourselves and your little friend—um, what's his name?"

"Jerry," he said, not trying to hide the edge in his voice. "Are you getting everything recorded and stored all right? I'd hate to find out we were so wonderful down here, and you guys zapped the damn recording."

"Don't get excited. Your place in history is safely stored away, waiting for the orders to packet-beam it all to Sagan."

"Look, that's what I wanted to talk to you about, Havil." He looked closely to see if Bilstein reacted visibly to the familiarity. Not seeing a change, he went ahead. "We both know that there's not much of a chance that the company or the government is going to let us transmit evidence that the Children are sentient." Bilstein started to say something, but Galway silenced him with one hand and quickened his delivery. "Miranda is just too valuable to mankind for us to resist that temptation. That's why you and I have to make sure that the information gets throgh to the people back home—not the governments and the corporations, but the *people*. Everyone knows about what's going on here, and I'm sure every station between here and Earth is already crawling with newscasters, waiting for the first reports to come trickling in. If we broadcast everything we have, the popular support for leaving the Children alone will be overwhelming."

"Forget it, Galway. We have to do this one by the book. It's too important to go screwing around with political games. We do this one by the book,

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period." Bilstein looked haggard on the screen, but managed to summon one of his threatening stares. Galway found it easier to ignore over the radio.

"Havil, let's assume for the moment that I'm right about the intentions of the company and the governments back home about Miranda, OK?"

"What's your damn point, Galway? This is getting us nowhere."

"You communicate with Sagan via encrypted packet-beam, and they tell you how to edit the evidence to their liking, or maybe they have you send everything to them, they do the editing, and then ship it back to you. Then you send the modified report to them unencrypted, and everyone picks it up, and—"

"Galway! Enough already!"

"—and then we wind up dying in some sort of accident! Can't you see what's going on here, Havil?" He fought to get his voice under control. "We can't be allowed to live, because we know the truth." Lesane swore as the point of the argument hit him. Galway ignored him and kept going. "The only way anyone from the *Nebraska* is going to survive this mission is if we ship *all* the information we have unencrypted, without warning anyone that it's coming. The newscasters will pick it up and relay the whole thing to Earth, and then we'll have a fair shot at coming home."

"You're crazy! The company doesn't want to kill us." The stony certainty was flagging in Bilstein's voice. "Do you know what kind of trouble we'll be in if we disobey orders?"

"You have nothing to lose, being so close to retirement, and we're willing to take the chance." Galway looked over at Lesane for a moment, and was greeted with an OK sign. "If I'm wrong, we get chewed out, and maybe we land a few crummy assignments. But if I'm right, we might save ourselves and the Children. You've seen what they're like, Havil. Is there any doubt in your mind the Children are an intelligent race?"

"I can't believe the company would set us up like that, Galway. It just doesn't make sense."

"If there's nothing going on, then why did they give you orders to hold all the reports until you talked with them?" Galway sat back and tried to relax. He studied Bilstein's face, and tried to guess what the captain would say next.

"Make sure you report in tomorrow night." The connection died, and Lesane pounded a fist against the wall.

The next morning, Jerry woke them shortly after dawn by banging furiously on the lander's hatch with a rock. Galway let him in while they dressed and assembled their equipment. Jerry patiently stood in the middle of the lander and watched them, completely ignoring the ship. Once everything was ready, they hustled Jerry outside and headed for the city again.

"The Truth says that it is my duty to show you as much of our city and our people as possible, before the Book of the Creators is read. Is that acceptable?" Jerry looked up at Galway expectantly.

"Yes, of course," he answered, smiling. "We'd love to learn all about your city and your people. What would you like to show us?"

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"A school, where we teach the children The Truth." Jerry looked ahead to the city, and started walking a little faster.

Galway and Lesane exchanged smiling glances and followed the alien.

In the city, Jerry led them to a large, round building near the river's edge, close to the park. When they entered the building, they saw an explosion of color. The children were dressed in the bright clothing they had seen the previous day, and sat at wooden desks that were arranged in concentric circles. The teacher stood at a lectern on a raised platform in the center of the large room. There were about 200 students, all about the size of a three-year-old human child. The room was very brightly lit, as several large sections of the roof had been opened. The three visitors silently stood against the wall near the door. The teacher studied them for a second without interrupting what he was saying. Galway pointed the translator at the teacher and hoped that the built-in microphone could pick up his voice.

"Why did the Creators give us The Truth?" the teacher asked slowly and deliberately.

"Because they love us! The Truth lives!" the children enthusiastically said together. They furiously rang their tiny silver bells and laughed.

"Why is The Truth so important to us?" the teacher asked.

"Because The Truth guides us and keeps us safe! The Truth lives!" came the children's answer, followed by another surge of bell-ringing.

"Why is The Truth good for us?"

"Because it protects us from the dangers of the world!" Again, the response was accompanied by the joyous outburst.

The catechism continued in this way for a few minutes, with the children not missing an answer. Then the teacher asked, "What happens when the new gods arrive in their skyboat?" The children looked around and stared at each other, and Galway and Lesane, with a juvenile version of the blank stare the humans knew all too well from dealing with Jerry. "The adult who first sees the skyboat becomes the ambassador—"

"Come!" Jerry whispered urgently. "We have other things to see!" He grabbed Lesane's shirt sleeve and began pulling him outside. Galway followed, frowning.

"What's the hurry?" Galway asked.

"There is much for us to see in the city, and the workers are getting close to the Book of the Creators. Come, I will show you one of our farms!" Jerry scurried away.

For the rest of the day, Jerry dragged them around the city and the surrounding countryside in whirlwind fashion, trying to show them a little of everything. The farm they visited was just outside the city, and was covered with neat rows of giant leafy vegetables that looked like dark blue lettuce. The farmer was male, younger than Jerry, but every bit as stoic. He told them about all the information on farming that is in The Truth, and how helpless he would be without it.

Next, they visited a metalworking shop near the farm where Children were diligently making small items, such as fasteners and nails. As at the farm, the Children were anxious to explain how complete and useful the information in

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The Truth was. One of the metalworkers gave them souvenirs, flat triangular nails and small silver-colored bells with wooden handles, identical to the ones they'd seen the young children using.

They stopped at another one of the large round buildings. This one was filled with men and women sewing new pairs of the ubiquitous overalls by hand. The workers presented the humans with two pairs of the garments which were obviously made larger in an attempt to guess the men's sizes. After that came a schoolroom full of older children, where the vocational aspects of the The Truth were being taught, without the benefit of the younger children's bells. The instructor presented each of the men with a leather-bound copy of The Truth. And on and on the tour went, through communal dining rooms and kitchens, and a leathershop, and a beautiful home for the elderly and infirm with a wonderful view of the river and the park, and almost countless private dwellings, where they were always greeted politely, if not warmly, and told that they would be prayed about.

By the time Galway and Lesane had managed to beg off and return to the ship, they were exhausted. Time spent in the confines of a spacecraft tended to decondition most people, since they eventually ignored their exercise regimens. Added to that was the burden of carrying their gifts.

Galway sat on the edge of his bunk with his eyes closed and his elbows on his knees. He took a deep breath and tried to fight the tiredness, and organize what he was going to say to Bilstein. "I'm convinced we have to do something to help the Children." He slowly opened his eyes and turned to look at Lesane. "But I don't know what we can do."

"Looks like the only thing left is to call upstairs and try to convince Bilstein again."

"Yeah, that's about it."

Galway turned on the radio, and got Bilstein right away. This time he looked very relaxed, almost peaceful.

"Well, Faran, it looks like you and Lesane are a pretty big hit with the natives, judging by all the trinkets they gave you. You two are still doing one hell of a job, if you ask me. I don't know what the company was so worried about. They should have had more faith in you."

Galway frowned at the complacent face on the screen. "Havil, why the sudden joy? What's going on?"

"Nothing, Faran, nothing at all. From what I've seen, it's a sure thing your little friends will be left alone. You've got enough evidence to prove whatever the company wants."

"That's what I'm afraid of. I don't understand why you're so sure it's all on the up and up."

Bilstein's expression changed from pleased to hard and muscular. "Right after I got done talking to you yesterday, I sent a message to Maris Naramore, at Sagan Station. He's the man the big boys put in charge of this operation. I asked him about the criteria for judging the aliens—"

"Children!" Galway said, angrily.

"Children, aliens, whatever. I asked him what was important in judging them and mentioned some of the things you've discovered so far, including all that stuff about their religion. His reply came in

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just a couple of hours ago. He said that practically any sign of organized religion or community activity would be a sure sign of sentience. In fact, he said that you guys should wrap it up right away, since you've found out enough already."

Galway sighed deeply and closed his eyes for a moment. "Havil, don't you see what you did? You told them enough to seal our fate, so they want us out of here immediately."

Bilstein's face reddened. "Galway, I'm getting sick of your bullshit. Why won't you accept that maybe just this once the big boys are going to be the good guys?"

Breathlessly, Galway asked, "Did you tell them about the Book of the Creators?"

"Sure, that was the first thing I mentioned."

Galway pounded the command console with one fist and yelled, "Open your damned eyes, Havil! Think about this situation for a minute. The Children are digging up a 150,000-year-old artifact from another intelligent race, and the company doesn't want us to stick around to see it! If that doesn't tell you how interested they really are in the Children, then I don't know what will. *All those bastards care about is this planet!*"

Bilstein stared at Galway from the screen, the muscles in his jaw visibly working. "Even though it's against orders, stay another night and check out that damned book as soon as possible. I can always lie and say that in all the excitement I misunderstood when I was supposed to call you guys back. They should buy that."

* * *

They were awake and ready to go when Jerry's banging sounded on the lander hatch. The men stepped out into the morning sun, and admired the deep blue sky.

"Jerry," Galway said, "How much longer before the workers reach the Book of the Creators? We have to leave today, and would very much like to see it."

"The workers have uncovered the Book. We should go there now." He immediately started walking toward the city.

As they neared the public square, there was a huge crowd of tightly-packed Children around the excavation site. "My God," Galway said quietly, to no one in particular, "who's here?"

"Everyone," Jerry replied flatly. "The Truth lives."

Jerry continued walking calmly. He passed through the parting crowd without touching anyone, then stopped in the large clearing and looked downward. Galway and Lesane came up behind him and looked over his shoulders at a large, square glass container on the ground. It was half a meter on each side, and ten centimeters high. The glass was thick, except for a long, thin stem that protruded from one side and was pinched near the end. The glass was marked and etched, obscuring the view of the large gold-colored object inside.

Jerry pointed at the container and quietly said, "The Book of the Creators. The Truth lives."

Galway tapped Jerry on the shoulder. "What do we do now?"

"The Truth says that you are to open it."

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Galway stooped and examined the glass envelope for a moment, then stood and broke the stem with one heel, creating a faint hissing noise. After the sound stopped, he smashed the container with a rock and retrieved a large, gold metal plate from inside. It was deeply inscribed with Children writing. He handed the plate to Jerry. Even though he was too occupied to look away, Galway was keenly aware of the large crowd's perfect silence.

"The Book of the Creators," Jerry said quietly. He rubbed the metal plate with his fingers and stared at it, then looked briefly at each of the men before he began to read. "Welcome voyagers. You have no doubt come a great distance to this planet, and learned a great deal about the race that inhabits it. It is now time for you to learn the truth about this race and us, the ones the Children call the Creators. At the time the Children civilization was begun, we were a very old and advanced race. We had traveled to many star systems, and had learned much in the process. The most painful lesson we learned was that we were too trusting. In our naive adventuring, we ran across a race alien to us. They were ruthless warriors, intent on destroying or enslaving any life they encountered. We could not run from them, for they were a spacefaring people, and once they knew of us, they swore to their many gods they would not rest until they had conquered us. We eventually won the ensuing war, and destroyed them in the process. But the price we paid in lives was terrible. Over one half of our race, spread out as it was on dozens of worlds, died. We could never let this happen again. But we did not wish to run and hide from other intelligent races that might someday find us. So we chose a series of likely planets, and created the Children. They are an artificial race. We gave them a religion, The Truth, that was designed to ensure both their survival and their value as a beacon, to assist other peaceful races in finding us. Unknown to them, their daily prayers have kept us constantly informed about their well-being, since our great hive-minds can instantly read their feeble mental projections from even this distance. By the time one of the Children reads this message, we will already possess their collective knowledge of you. At this moment, the entire population is relaying your reaction to us."

Galway and Lesane looked around nervously and saw that the Children were all standing perfectly still, with nearly closed eyelids, in a trance-like state. Lesane grabbed Galway's upper arm in a tight grip and whispered anxiously, "They said they prayed *about* us—remember?"

Jerry kept reading, and the translator continued, "Taking the distance from this planet to its star as one unit, and the hemisphere that this continent is in as the northern one, extending a line 7,368,096 units from the center of the star in a southerly direction will lead you to one of our planets.

"We hope to someday meet you on peaceful terms."

Jerry gently placed the plate on the ground and stared at the men, shaken, expectantly, and said, "The Truth lives."

Galway put one hand on Jerry's shoulder and said, "No, The Truth does not live. You heard what the message

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said. It's all a trick. You've been used by another race of people, Jerry, not gods. You don't have to follow The Truth anymore. You can be free from all that. You and your people can make your own rules, do what you want. There's a whole beautiful world here for you to explore, now that you're free."

"But we don't know how to do those things, Galway. All we know is The Truth. For us, The Truth does live."

"Not any more, little fella," Lesane said quietly. He looked at Galway. "We're going to help you. Aren't we, Faran?"

Galway looked at Lesane and ground his teeth together, feeling his responsibility suddenly press on him with its full weight. He tried to imagine a race with not the slightest streak of curiosity. How could they survive without The Truth to be their guide? He turned off the translator, then picked up the radio and called for Bilstein. When he reached him, he was quick to the point, "You heard everything that just happened, right?"

"I heard it, Galway." Bilstein said slowly.

"Havil, we don't have a choice any longer. We *must* send the recordings back *immediately*, including what the Book says. Who knows what kind of warriors the Creators are, and how they would react to anything we did to the Children."

"Galway, should you be saying this in front of them, I mean . . . " The apprehension was thick in Bilstein's voice.

"What's wrong? Are you afraid that the Creators might find out what we're really like before we have a chance to stack the deck?" Galway glanced at Lesane, and saw confusion being replaced by a conspiratorial smile, then continued. "Look—if the big boys are smart enough to see they can't take this chance, then it means nothing if we send the recordings now."

There was a long pause before Bilstein answered. "You win, Galway. You're right—it's too risky. I'll start sending it all out right away, unencrypted. God knows what kind of trouble your political games are going to get us into. I just hope you're right."

Lesane whooped and dropped the camera, then threw his arms around Jerry and bounced the confused alien up and down. Jerry looked frightened and was speaking frantically.

Galway turned the translator back on and heard Jerry asking, "What is happening? Is something wrong? Why is Lesane doing this to me?"

"Everything's OK, Jerry. Lesane is just a little excited at what the truth can do."

Galway stared out the window at Miranda. In one hand he held his copy of The Truth. He'd already started to learn the Children's language and writing, but it was going slowly, since the ship's computers had only a mediocre understanding of either, and still tended to guess at meanings occasionally. He distantly wondered how much of a flap there'd be over what they'd done. He didn't really care. All that mattered was that the Children would get a fair chance, and nothing bad would happen to them at man's hand. The only debate seemed to be over how much and what kind of assistance the Children would

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need in expanding their society beyond the artificial confines of The Truth. He and Lesane already had been contacted with a list of questions directed at that topic. He hmpfed and smiled as he thought about the developments of the last few days. Most of the crew had already picked up that mannerism, as well as a totally blank stare which was used mostly for comic purposes.

Galway looked down at his copy of The Truth, and rubbed the tooled characters on the leather cover. How could they do this, he thought. How could an intelligent race be so callous? They created an entire civilization and took so many precautions, just to serve as a lightning rod. And it wasn't even an effective lightning rod, at that. It'll take some time, but we'll meet them some day, now that we know they exist. They certainly sound like one race man will see eye-to-eye with. ■

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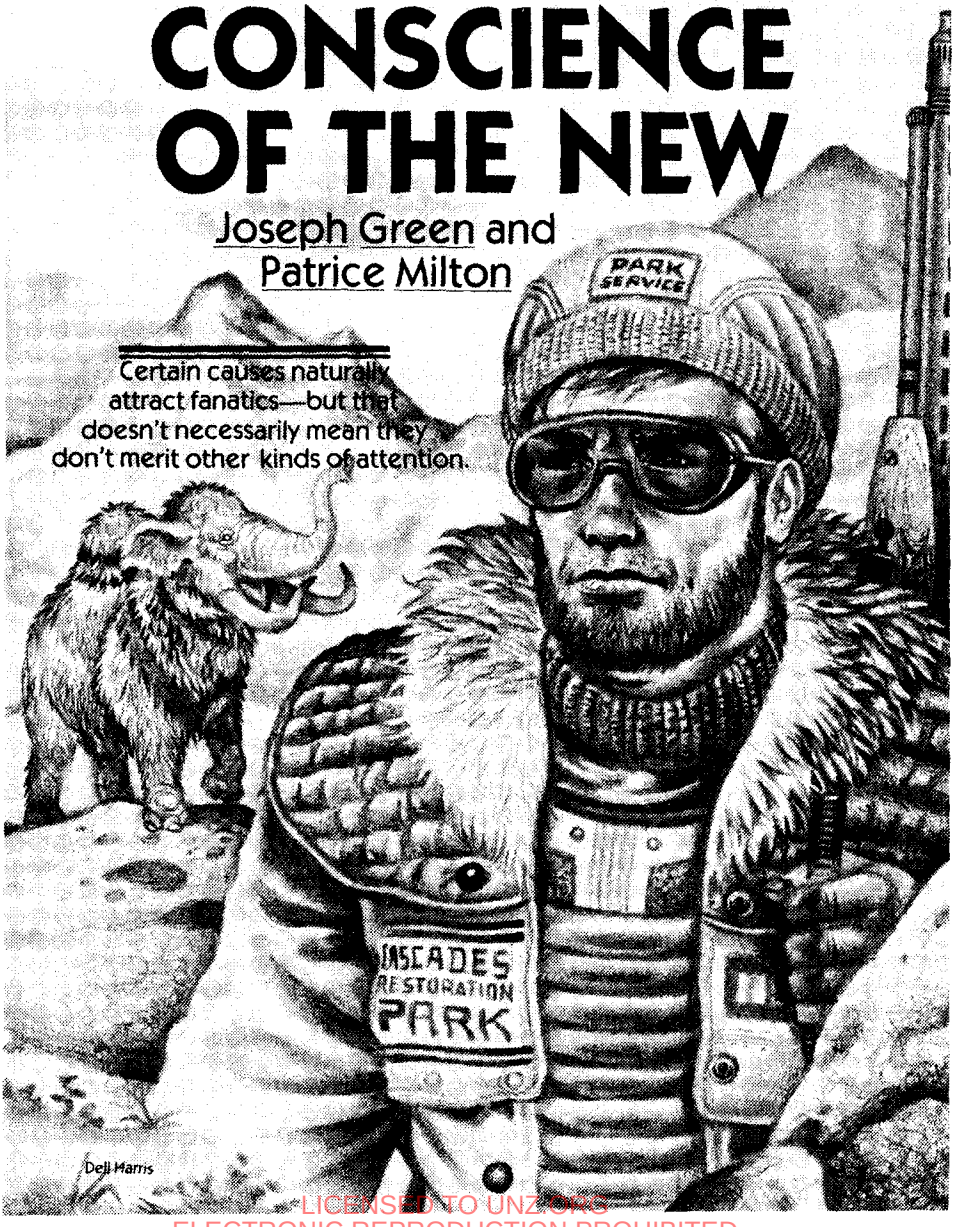
WITH CONSCIENCE OF THE NEW

Joseph Green and
Patrice Milton

Certain causes naturally attract fanatics—but that doesn't necessarily mean they don't merit other kinds of attention.



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"Linc, our informer in the Children's Plan just called again. The raid he warned us about last month is set for tonight. He told us where they're coming in. I'm going to send Chief Ranger Hansen out to meet them with an interception party, and I want you along as second in command."

I stared at the deeply lined, sunbrowned face of Park Manager Curtis Ransome in amazement. My title was Assistant Zoologist, and I was a park ranger only by courtesy, a dollar-a-year appointment. The green-gold badge gave me a look of authority when I stopped tourists from feeding the animals. It didn't qualify me to help arrest a group of armed religious fanatics.

Ransome saw my surprise, and grinned. "We don't expect any real resistance, Linc," he went on, his rough, scratchy old voice quavering slightly. "When they realize they're caught, the Children will lay down their bows and arrows peacefully. HQ wants us to arrest as many of 'em as possible. Some rehabilitation time will discourage other cult activists. That's why we aren't calling for outside help, and are going to let them inside before springing our little trap."

"How can you be so sure they won't aim a few arrows at us?"

"Trying to slip poison into the herd's food—and HQ is convinced it was them, both times—is more their type of operation. The Children aren't one of your dangerous revolutionary groups. What worries me most is a possible overreaction by our own people. We only have five tranquilizer guns. The rest of you will have to carry hunting rifles. I want you there as a restraining influence, to be sure no one gets hurt."

Some of our fifteen park rangers were young, and impulsive; others old, and short-tempered. The potential for real violence was there. But I couldn't see Lincoln Mendela Jones as the right person to prevent it.

"I'm dividing the rangers up into two groups." Ransome turned to the large projected wall-screen map of Cascades Restoration Park behind his desk. It showed the three mountain valleys that joined to form a rough Y-shape, over four miles long on the eastern side, in fine detail. "Hansen and nine deputies, counting you, will wait here, just below the Webberts Canyon retaining wall." He tapped a point in the northwest fork. "The Children will be coming over it about three A.M. Your group will have three tranquilizer guns, two portable searchlights, and two nightscopes. As soon as all five or six are on the ground, you turn on the lights, order them to surrender, and take them into custody."

"You make it sound easy. What happens if they decide to run? Or enter at some other point?"

"If they run, the rangers will get as many as possible with the trank guns. Even if some get away, the raid will be over. All they'll be concerned with is getting out of the park before daylight, to avoid arrest. But just in case some bolder ones try to continue, a second group of five rangers, under Deputy Chief Macintosh, will be stationed here—" Ransome touched the screen "—on the open ground, just outside that favorite little glen where we expect the herd to bed down tonight. Now we think our informant is reliable—but if the

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Children enter at some other point, the second group will move quickly to get between them and the herd. Then your larger group can close in on them from behind."

Ransome had an answer for every contingency. I left his office feeling somewhat better about the impending raid. And I badly needed the reassurance, because I knew something the old man didn't. My ex-roomate at college, Sumiko Tashimoto, was an officer in the Church of the Children of God's Plan. She was a capable, stubborn and determined person—and it was very likely that she would be the leader of the group that intended to rid the Earth tonight of its only herd of mastodons.

I walked the few steps from the manager's office to the large common room on the top floor of the lodge, and into the deep alcove, cut through solid rock, that ended at the main observation window. The glass here was six feet high and fifty-six feet wide, in eight-foot segments. There were many other similar but smaller windows at the ends of tunnels in cliffs on both sides of the park. Here the one-way glass, tinted brown on the outside to blend into the rockface, was about eighty feet above the valley floor, on the east side. Tourist traffic was still slow in early May; only about ten people were eagerly pointing binoculars or minicorders at the scene on the ground below.

This cedarwood central lodge had been planned to overlook the juncture where the three narrow valleys joined to form the Y, the largest semi-open area. No buildings of any kind were permitted inside the enclosed park. The herd was feeding off the main food-tree—which I had carefully located directly in front of the window—before settling down for the cool night. Ransome was right; they would be sleeping in the little glen a few hundred yards to the south.

The lead bull and four cows were clustered around the artificial tree, helping themselves. The "branches" were only about neck-high; all the food could be reached without pushing one over. The firm foodballs, a rich and varied mixture of oats, barley, hay, corn syrup, and an assortment of drugs, ranged from a golf ball to a human head in size. They were attached to the tree branches by impaling them on sturdy green metal "thorns." The gamekeepers restocked them at night, when the herd was sleeping in some other area. The eight trees, which were widely scattered throughout the park, were my own idea, and I was proud of them. They helped maintain the Cascades Restoration Park approach of raising these animals in surroundings as close to the natural state as possible.

The lead bull, young but fully grown at age thirteen, stood over nine feet high at the shoulders; the four cows were slightly smaller. All five had thick coats of brown hair tinged with red, which they had not yet started to shed this early in spring. The long, serpentine trunk, the thick curved tusks, the head low-set in front of massive shoulders, made an unmistakable profile. *Mammut americanus* was not a beautiful animal—but these were one of the most successful examples of humanity's new ability to awaken sleeping genes and put active ones into hibernation, recreating nature's cast-off earlier forms.

The young bull and the four cows

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finished feeding and turned away. The second bull edged forward, with the remaining five cows competing for close positions around the tree. The pushing and shoving were gentle. They had learned as adolescents that these trees never stopped producing their richly filling and tasty fruit.

The real pride and joy of Restoration Park were the three new calves, all still too young for solid food. They waited, huddled together, as their mothers ate. The same-day birth of the first two, three months ago, from very young cows and the older lead bull, had made ViText headlines around the world.

The sun was now below the mountain peaks to the west, and shadows were creeping swiftly across the valley. The herd milled about aimlessly until the last cow's stomach was filled, then suddenly formed up single file. They headed purposefully for a narrow path leading into the thick stand of Noble fir and Sitka spruce on the western side of the south valley, just below the juncture.

The mastodon herd was a magnificent, an awe-inspiring sight, one that never failed to move me. It was not so much the animals themselves—they were not quite as large or graceful as African elephants—but what they represented. Many smaller mammals had been successfully recreated in various laboratories. The USSR, a little ahead of us as usual, had second generation mammoths at their Siberian World Preserve that were already weaned. But the Cascades Restoration Park mastodon herd was the only restored group that had been raised in surroundings as nearly natural as we could make them. That included the last elephant mother having been gone from this park now for almost three years.

The tourists around me were busily recording, as best they could in the fading light. I heard little murmurs and gasps when each of the three calves fell into step behind its mother. And I wondered how anyone, no matter how far gone into religious fanaticism, could want to kill these unique and wonderful small creatures.

"Those things are lots uglier than elephants," said a plump, gray-haired woman to her husband as they turned to leave. I was wearing regular clothes, and she was unaware I worked at the park. "But what I want to know is, if the geneticists can go back and recreate old animals that have disappeared, why can't they do the same thing with people?"

And there, in bald, direct words, was the real fear that drove The Children of God's Plan and several other religious groups. Mankind now had the ability to control genetic expression on a scale undreamed of by earlier scientists. The possibilities for misuse that were inherent in the technology worried a lot of people, including myself.

I stared after the retreating animals . . . *And suddenly, in my mind's eye, I seemed to see ghostly mahouts sitting on the necks of these great creatures* —Homo sapiens *on that lead bull,* Homo habilis *on the following cow,* Australopithecus afarensis *next,* Ramapithecus *trailing . . . semihuman but more and more beast-like creatures descending through* Dryopithecus, *into crouching, instinctual brute . . .* And I wondered in how many labs around the world ambitious scientists were

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awakening and quieting genes in *human* sperm and egg, despite the strict laws passed in 2028. How many experimental embryos, now growing in glass dishes, might represent the next obvious bold move, a one-step regression of two, three, or even more evolutionary stages—and what would we do with the living, subhuman creatures who would emerge if they succeeded?

Brooding over matters, which I had no control over, was a waste of energy. I checked with Tom Hansen, and learned that the main party was going out at twelve o'clock. The Children were supposed to be in place shortly after dark, ready to come over the wall at three A.M. Their plan was to move in on the herd in the darkness. In the light of early dawn, they would string powerful compound bows and send a flight of arrows into the still sleeping animals—arrows tipped with a deadly and fast-acting poison. And that would be the end of a billion-dollar experiment in genetics, a result for which the fanatical Children were willing to go to jail if necessary.

I went to my room immediately after dinner in the staff dining hall, read for a while, and tried to doze off for a couple of hours. I lived at the park because I enjoyed being there. It was a haven of order, sanity and stability, in a world too often chaotic and semi-mad. In 2034 the fanatics with strongly held views seemed always to outnumber and overpower the people of reason. Besides, the low cost was helping me save for a house of my own someday, in the beautiful hills surrounding us.

The excitement level was too high; there was no sleep for me. I still felt keyed up and tense when I met Tom Hansen and the others at the main service entrance.

We piled into two of the quiet little open-body electric trucks, raised the camouflaged main door at ground level below the lodge, and headed northwest. We were all wearing ranger uniforms, with electric thermal environmental suits inside and winter coats outside. Hansen had issued me a rifle, a regular one. I was a good shot, from long practice on the firing range, but the three tranquilizer guns in our group had been issued to the best among us.

Hopefully, none of these weapons would be needed. I knew for certain that I could never actually fire my rifle at another human being.

It was only a fifteen minute slow drive north up the west fork to Webberts Canyon, and along it to the concrete retaining wall, painted green and brown to match the landscape, that abruptly closed it off. The slopes on both sides were steep, and thickly wooded; the easiest path for the Children was directly over the top. Under Hansen's direction, we set up the two searchlights to cross their beams at the base of the wall, working very quietly in the darkness. The raiding party, snug and warm in their sleeping bags, were supposed to be waiting on the other side.

I hoped they were all too nervous and excited to sleep a wink. . . . and that Sumi was not among them.

After we were deployed in a semicircle and ready, we settled down for the actual moment when the Children broke the law by unauthorized entry. It was bitterly cold in the middle of the Cascade Range, ninety miles northeast of Seattle, but the electric undergar-

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ments kept us warm. Once we were still, I found myself fighting to stay awake.

At least an hour went by, with few sounds disturbing the cold peace of this early spring night. I could not stop my mind from returning to memories of our last two years at the University of Washington, when Sumi and I had lived together off-campus. I had been on a straight genetics track since secondary school, and was just getting into the really tough courses as a junior. Sumi offered comfort and consolation as the realization slowly dawned on my personal horizon that I was never going to become a geneticist. My mind apparently ran in different channels. And I loved the outdoors too much to spend my life crouching over complicated machines in sterile laboratories. Also, four-fifths of modern genetics was computer extrapolations, which I found difficult, boring and frustrating.

Withdrawing from a chosen career path followed since tenth grade was a traumatic experience for me. I was barely over it when Sumi reached a similar crisis. She had started out in biology, switched to psychology, and later changed to sociology, but was still dissatisfied. She made a fourth and final career choice, into political science, and at last seemed content.

Sumi was always joining and quitting off-campus groups, restlessly searching for something missing in her life. During the two years we were together, I saw her move steadily away from the natural sciences toward the softer, more comforting embrace of religion. A suppressed but deeply seated need, instilled by strongly religious parents, had come alive again. The temptation of the transcendental was too strong for her to resist. She needed the assurance that a better world awaited her than the one this chaotic life offered.

Sumi appeared content during our senior year, and I had learned to live with my limitations. But during the last semester she started attending services at the University District Church of the Godly Together. There she met a young charismatic named Gerald Cannaughton. He was serving an apprenticeship as assistant pastor to the former televangelist heading up that small denomination.

On the day we graduated, Sumi packed and moved to a separate apartment. She left without warning, and avoided seeing me to say good-by. There seemed little doubt that she had been seeing Cannaughton, despite our promises of fidelity to each other.

I went on to graduate school to get my masters in zoology. Cannaughton soon organized his own telechurch, called The Children of God's Plan, and Sumi headed up its political branch. I heard later that their affair had cooled—Gerald found a new love—but he had the unusual gift of staying on good terms with his ex-lovers. Sumi remained with him, and became a political activist for sensational and newsworthy church causes. The latest was an attack on all "sleeping gene" projects, such as the mastodon herd which I had helped shepherd and guard since graduation six years ago.

Gerald Cannaughton was leading the attack from his Tri-D pulpit. His faithful followers were out in the streets, and Sumi was orchestrating pressure tactics to influence uncommitted members of

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Congress. No laws had been changed yet, but the Children and some other powerful groups—not all of them religiously oriented—were having a very real effect on public opinion.

Suddenly, I was pulled out of a half-doze by Hansen vigorously shaking my arm. "Linc! Wake up!" His voice was a hoarse whisper. "We just got word on the radio. This was a diversion! They're actually coming in through the east valley, down Doreen's Trail. We've got to get back there, and fast. They may already be inside!"

Careless now of noise, we loaded up the lights and batteries in a hurry and tore off down the slope, driving as fast as the rough terrain allowed. It took most of an hour to return to the juncture and back up the east fork almost to the end. We reached Doreen's Trail just before three o'clock. This was a stepped path cut into a steep hillside on the eastern slope, far too difficult for the mastodons to follow. We hurriedly set up the lights, and waited. Unless the Children had backed out entirely, they should be coming soon.

Fifteen minutes later Hansen's radio crackled again, and we learned the hard truth. Ransome, who was directing operations from his office, had posted gamekeepers up and down all three valleys, unarmed but with radios. One had just reported in. The Children had come in over the Sykes Creek retaining wall on the west side of the south valley, only a few hundred yards below where the herd was sleeping.

That seemed to make it clear that our mysterious informant was one of the Children, and they had succeeded in luring most of the park's armed force well away from the action. Something else suddenly became obvious to me. One of those tourists with whom I had watched the herd at sunset had to have been a spy for the Children. He or she had told them exactly where to find the sleeping mastodons. And that had made it possible for them to divert the largest group of rangers to the most distant point in the park.

Ransome was sending the smaller group down the south valley to try to intercept the raiders, but they had to make a wide detour of the thick woods where the herd slept. The mastodons, short-tempered and edgy, would be far more dangerous than any humans if they were aroused in the darkness.

This time we left the lights, piled in the little trucks, and headed south at maximum safe speed. It was an open run down grassy slopes, all the way to Sykes Creek. If the Children were slow at finding the herd in its snug glen, we might still be in time to help the second group round them up.

We didn't make it. I was sitting by Hensen in the lead truck, and he relayed what Ransome was getting. There had been eight to ten Children in the party. They had moved in the right direction, approaching the herd from the southeast, but going very slowly in the darkness. Our people had rounded the wooded area where the herd was sleeping and caught up to the raiders from the rear. But they were in the edge of the trees by then, and instead of surrendering on demand, the Children had scattered like quail. The two rangers with tranquilizer guns had gotten three of them. The others had vanished in the darkness.

"Those that don't get lost will be out

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of the park by daylight," said Hansen. "And we can send the three they caught to rehabilitation for a few years. That should put a stop to this nonsense."

"Maybe," I said, remembering Sumi. She had always been a very stubborn and determined person, when convinced that she was right.

We caught up with Macintosh's group and their three groggy captives. The needles had been loaded with just enough muscle relaxant to put a human down for about an hour. The raiders, a plump, gray-haired woman and two thin young men with dark beards, all dressed in black clothes, were being helped toward the main lodge.

I was almost certain Sumi would have been at the head of this small force. If so, she could easily have moved forward when they were attacked from the rear. Sumi had always been action-oriented, and she never backed away from a fight.

Which made it very probable she was still loose in the park. With a powerful bow and a quiver of highly poisonous arrows.

Hansen assigned some of our people to help with the captives, and we headed back toward the trucks. I looked to the east. There was a faint lightening in the sky beyond the dark bulks of the distant peaks, a first touch of cold gray in the star-speckled sky.

Hansen and Macintosh were talking in low tones as they headed for the lodge, walking. I fell back gradually until I was the last person in line, then drifted into a deeper clump of shadows and let them vanish into the night.

I hurried back along the way we had come—familiar territory I had covered many times in the daylight—then cut back northwest, toward the sleeping herd. If Sumi was here, she was probably creeping toward the animals at this moment, bow strung and ready.

I wondered how anyone could look at those three hairy little calves, ugly though mastodons might be, and still send an arrow into such helpless young creatures.

A lot of my time was spent studying the herd, and I had learned to be quiet on my feet. I managed to get within a hundred yards of the little glen in silence, without seeing anything unusual in the slowly graying darkness.

And then a darker shadow moved out from under the trees just ahead of me, and I froze. The figure stopped, knelt, and I saw a tiny flash of light, almost at ground level. The face was dimly outlined in the reflected glow. To me it seemed inevitable, almost foreordained, that it would be Sumi—and it was. She was consulting an instrument—probably a compass.

Even that small light was enough to reveal the bow protruding above her head, the quiver at shoulder level. My worst expectations had been confirmed.

A small morning breeze drifted through the grove from the north, blowing gently into my face. It brought the faint but identifiable odor of fresh elephant dung.

I moved up more swiftly, wanting to catch her before we were close enough to alarm the herd. If one of those bulls heard us and awoke, and came back to investigate, we would both be killed.

I was within forty feet of Sumi when my incautious speed caused a twig to crack underfoot. She turned quickly, saw me, and threw the light on my face. With the other hand she was pulling the

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bow off her shoulder. The handlight went out, but there was now enough gray dawnlight for me to see her hand move up to the quiver and down again.

"Linc!" she called, in a low, intense voice. "Linc, why did I know it would have to be you?"

I moved ahead, stopping about thirty feet away when the bow rose slightly. "Because I'm the only one who knows you, Sumi. The other Children have all had the good sense to leave. I knew you'd still be here."

"I'm going to finish the job, yes. Those abominations in the sight of God have to be cleaned off the Earth. I have exactly enough arrows. But I've practiced, Linc, until I was really very good. I won't miss a one."

"They'll see you after the first couple of shots. The herd bulls will be after you in seconds. Even if you hit both of them, they'll still reach you before you can shoot all the rest." As I spoke I was easing my rifle slowly off my shoulder. With my right hand on the stock I pressed the safety bar on the bottom in the right sequence, and then touched the "load" button. There was an audible click as a bullet popped into the chamber. Sumi heard it, and interrupted me.

"Stop it, Linc!" I saw her hand on the arrow, where its nock fit the string. "You know you can't shoot me. As I could never harm you, unless it was God's will. We still mean too much to each other."

"Wrong, Sumi." I brought the barrel down until it was pointed just above her head, though the rifle was still at waist height. "I can't kill you, but I'll stop you by putting a bullet through a leg or a shoulder." I started walking toward her, hoping my bluff had sounded convincing. "You're the one who can't shoot. The poison on that arrow would kill me before you could get help."

The bow came up on my third step, with the arrow pulled to the limit. Her voice was still low, but in it I heard the absolute conviction of the fanatic. "*Stop!* Stop right there, Linc! Not another step."

The light was now good enough that I could see the intent expression on her face, a slight quiver in the arm extending the bow. And I believed her. There was no bluff in Sumi. She really would send that poisoned steel at my heart.

Somewhere deep in my psyche, the realization that Sumi actually would kill me brought a new understanding of her. She was too far gone into the depths of unthinking belief to accept reason. Nothing would stop her except a stronger force.

And with that perception of Sumi came a better understanding of myself. I would use force also, before I'd let her launch even one bringer of death toward those helpless, hairy little calves.

But unlike Sumi, who was willing to die if necessary, I very much wanted to live. In some small part of a second I knew what had to be done, and tried to act on it before she could read my intentions. I raised the rifle to my shoulder and jumped to the right in one simultaneous motion, while aiming at the dark corner of her upper right arm. I knew instinctively I was on target when I squeezed the trigger in mid-air.

The gun cracked like thunder in the early morning, but not before I heard a distinct *s-s-s-h-h-s-h-s!* as the arrow passed under my raised left arm. Sumi

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had beaten me to the shot. And she had leaped also, the instant her fingers loosed the arrow shaft. She had jumped slightly up, and hard to her right.

My bullet caught her in the air, but lower in the body and a foot over from my aim point. I saw the impact on the black cloth as the high-velocity steel slug struck her on the upper left breast. As I recovered my balance without falling I saw her mouth open, a soundless cry of outraged despair parting the short, full Oriental lips. I saw the bow starting to fall from nerveless fingers, out of which all wiry strength had departed. I saw her starting to die before my eyes, from a bullet through the heart.

I dropped my rifle, the automatic safety clicking on at impact, and rushed to Sumi. She had fallen on her back, with both hands raised to the hole out of which bright red blood was pouring, in a vain attempt to stem the flow. She had time to look up at me as I knelt beside her, an uncomprehending stare in which I saw nothing but disbelief, and then her head fell to one side. Seconds later I heard the death rattle gurgling out of her throat with her last expended breath.

There was no possible way to get help for Sumi before a lack of oxygen caused irreversible brain damage. The only woman I had ever truly loved was irretrievably dead.

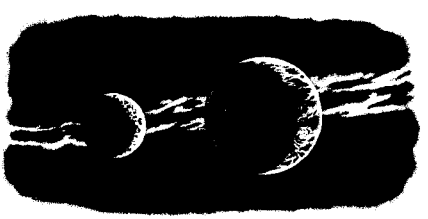
The sun was well up when the two gamekeepers, dressed in the horned and scented costumes that let them pass before dim mastodon eyes as black-tailed deer, came looking for me. They had a litter, in case I was injured. With the light body of Sumi as their load, they led me back across the open ground and into one of the small tunnels cut through the eastern rock wall.

I told Ransome what had happened, with the lights up and recorders on in his office. He sent the gamekeepers back out, to find the arrow that had missed me, and record the tracks Sumi and I had made. Then they put me in the small infirmary next to the much larger veterinary clinic. And they gave me a dose of trank that would have put one of the adult mastodons to sleep.

I was cleared of inadvertent homicide during the preliminary investigation. A month later I was back at work. I've finally been able to reconcile Sumi's death with my own actions, and find a type of peace.

But I've also joined one of the sane, reasonable, and scientifically oriented organizations that are fighting, through legislative channels, for strict controls on genetic recreations.

That will be my life-long tribute to Sumi. I think she would be happy to know that, in a way, she won after all. ■



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THE BEST IS YET TO BE
Lyn Murray
Anticipation is often almost as much fun as the thing anticipated but it doesn't work the same for everybody.
Anthony Bari

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David blinked, and stumbled slightly. A momentary disorientation; nowhere near as bad as he'd feared. He was in a dimly lit room. Alone—a weight lifted from his mind and he relaxed slightly. That had been their biggest fear, that he would appear in the middle of a crowd and create a panic.

He stiffened again as a door opened. But carefully prepared phrases died on his lips as a little old lady walked carefully, with the aid of a single stick, into the room. She smiled, as if in recognition.

"Well, David. Punctual, as ever." She linked her free arm through his while he was still groping for a response. "Come, my dear. We have been waiting to see you. But there is so little time."

The firmness of her grip on his arm, and the way she directed him towards and through the open door, belied her appearance of frailty. But what the hell was going on? His arrival seemed to be anticipated. That must mean his mission was a success! He'd got— would get —back OK, and would go down in history. This must be some kind of official reception. Who would've thought it!

But the crowded room he was led into lacked any trappings of officialdom. It looked more like a wedding feast, or an anniversary celebration—a family reunion. A burst of applause greeted him, and a rustle of sound. "It *is* him!" "Just like his pictures." "Isn't she brave?"

The old woman led him to a table where two younger, but still elderly, men stood. They smiled, a little more uncomfortable than the woman, it seemed, and offered their hands, which he shook in turn.

"But what? Who are you?"

She shook her head, and reached up to place a finger on his lips.

"No time for questions, David. You will have all the answers soon. There is no time at all." Was that a tear, glinting in her eyes, in spite of the smile? "But I wanted you to meet my family. My children," she indicated the two men, "grandchildren, and their own families." Her manner became more serious. "David, you must remember two things. First, the date." He'd forgotten! Hadn't even tried to find out! So much for his perfect memory. But she'd understood. The smile returned. "Don't worry David, everything is fine. The date is April 27, 2193, Old Style. I *know* you won't forget. And the other thing you must remember is, the best is yet to come."

She stood on tiptoe to kiss him lightly on the cheek. As she did so, in response to the signal, the assembled company raised their glasses in a toast. "David and Maria!" Who on Earth was Maria? He was beginning to get his bearings now. Time to start asking questions.

The disorientation was the same. It only *felt* worse, he grimly told himself, because he hadn't been expecting it. That was why the old lady had been in such a hurry. She'd known. Well, here he was back in the lab. Not much to report, but not bad for a first attempt. He opened his eyes.

It was the same room as before, but this time sunlight streamed in through the windows. Late evening—but *which year?* He turned slowly. On the other side of the room, carefully placed to be out of his line of vision when he opened

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his eyes (no, the thought was paranoid; he suppressed it) was a table set for two. The same old lady sat at one of the places, smiling at him. He blinked in the sunlight. Or was she the same? He took a step forward; her sister, perhaps, or . . . her younger self!

The panic began to return. Something had gone wrong. It should have been a straight-forward trip up and back. No detours, according to Roger's calculations.

"Welcome, David." The soft voice soothed his worries. "Won't you join me?" She indicated the second chair. "We have time for a meal, and I can answer some of your questions. But we only have a couple of hours, and it is best if we make a beginning."

Almost in a dream, he took the offered seat and looked across the table at her. She smiled—the same smile.

"Yes, David, it is me. If I were twenty years younger—but then, I did." The eyes sparkled mischievously. "This time, we must make do with food, and wine, and company. I think I've chosen some things you will like."

He surveyed the table. She certainly had. He couldn't have chosen better for himself. Somebody round here clearly knew a lot about his taste—and it was equally clear who that somebody was.

"Who are you?"

"My name is Maria. And I know all about you, David. Our lives are inextricably linked, for better or worse. And so far, I think for the better. For you, the best is yet to come."

He shook his head, confused. "You said that before."

"Did I? It used to be one of our favorite old poems. But your before, David, is my future. You mean, I *will* say it, again. How nice.

"But, of course, you have begun to realize what is going on, haven't you? So, eat and drink while I fill in the gaps. I'm afraid I no longer have much of an appetite, at my age, for many things."

He nibbled at the food, and drank a little more wine than he had intended, while she talked. Her voice was soothing. He could have listened to her for hours, and she seemed almost to read his mind. Half questions and interruptions to her explanations were met with clear and polished responses. So Roger had been half right, at least. The technique had worked, and David had gone forward, further than they'd dared hope, all the way to 2193 (Old Style, whatever that meant; he made a mental note to check when and how the calendar had been changed). But the process had set up a tension in the time continuum, and he'd been snapped back, almost immediately. Roger had suspected the possibility, which was why he'd been so insistent on David finding out the date before all else—and why he'd picked David, with his almost perfect recall, from the half dozen candidates ready and willing to make the first time trip. *But*, and this was the point Maria was emphasizing, he had only been snapped back part of the way. After a few minutes in her future, he'd been pulled back across twenty odd years to her now. Only part of the time tension had been released, but enough to give him a few hours respite before, if he understood her correctly, he continued his journey back.

"No David, *not* all the way back. I don't understand the technicalities, but

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I know exactly when you will return, and for how long. I will always be there, with you. Each time you get closer to your starting date, you will have longer to rest before the tension stretches to breaking point again. This time, we have only a few minutes left—long enough, perhaps, for coffee and brandy. Then you will leave me. I know the exact time, because you will tell me. It is now 9:15, and you will remember that, along with the date I gave you earlier. You told me, more than twenty years ago, that I would serve coffee at 9:15. So, here it is. I wish I could go with you—but that is silly. I *will* be with you. I *was* with you. Things will be easier for you now that you know what is happening, and you will have at least a few weeks to adjust. Farewell, David."

Her timing was almost perfect. His hand hadn't quite reached the brandy glass when the chair beneath him disappeared and he collapsed in a heap on the floor. Whew. Certainly not ready for that one, he told himself seriously. Time travel and alcohol definitely don't mix.

"David!" Soft hands helped him to his feet. "Are you all right? I didn't know what to expect. It is you, really you?"

But she was beautiful! He held her at arms length. Was *this* his little old lady? "Maria?"

"Am I so different, David?" She lowered her eyes, and, he was sure, blushed. "It's been nearly ten years, but you look younger than ever. But no—" a hand flew to her mouth "—when you last saw me, I must have been quite an old lady."

"You look wonderful." Was it the wine? Or the shock? Why did he suddenly feel so good? She stepped forward, into his arms, and tilted her face up to be kissed. He responded, enthusiastically. This was crazy! She must be at least ten years older than him, and he hardly knew her, and what he did know of her was when she was older still, and besides . . .

"You really never did that before?" He shook his head, then, realizing that she couldn't see, lying as she was nestled in the crook of his arm, he spoke aloud. "No. I was waiting for the right partner. For you."

She smiled, and wriggled even closer. "Then I am not too bad, for an old lady."

"You're wonderful. I never imagined—but I never would have—I mean, the disorientation. And the wine. I never would have been so bold—"

"So. You need to be drunk before you make love to an old lady of forty-two." She nibbled, exquisitely, at the base of his neck, while sliding her hand down his belly. "I'll remember that!"

"No! Maria, I didn't mean—" He stopped. My God. She *would* remember, and twenty years from now she would ply him with wine and relax him with conversation over dinner, in order to lower his inhibitions and pave the way for his seduction by her younger self. And she was right. He might have spent his life primly waiting for the right partner, unless somebody who knew him well had set him up like this. The wandering hand and nibbling lips began to distract him from this train of thought. No wonder the little old lady had such a twinkle in her eye when she told him

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the best was yet to come! He scarcely heard Maria murmuring in his ear. "One day, David, you will know how much it means to me that I was the first love in your life." But the words stuck, in that almost perfect memory.

They had nearly five weeks together, scarcely leaving the house, while David adjusted to his new reality. Maria refused to explain much more than he already knew. Next time, she insisted, he would have years, not weeks, in which to find the answers to his questions. She would be there, and she would be younger than him. What more could he want than a rejuvenated version of what she described as her "poor old body"?

The children were away, with relatives. She had no financial worries, she explained, because "the foundation" looked after the family. He never asked about the father of the children. There was no need. Maria was happy to have him for a few weeks, and there was no point in calling up memories that might be best left buried, for now. He dutifully memorized dates and times, and passed on to her the dates of their rendezvous in the future. He once found her crying over a large, brown book—a diary or ledger of some kind—but she brushed away the tears, locked away the book, and refused to discuss what was upsetting her.

Occasionally, he tried to work out how the timeslips were occurring, and where—when—the next one might take him. But Roger was the mathematician on the team, and without Roger there was no real hope of anything other than an empirical rule of thumb. If the slips were linear, and the stays were growing exponentially, he might go back another twenty years and stay there—then!—for ten. But after that, things would begin to get complicated. He doubted very much if he would ever get back to his own time.

He was deep in these deliberations when Maria came in from the garden, carrying a bunch of spring flowers. She sat beside him. He put his arm round her and they kissed, contentedly.

"This is our last day, David."

He sat up straight. "Why didn't you warn me?"

"Would it have made things any easier?"

He shook his head.

"I have a few things to tell you. Most important, the date on which your next visit—your previous visit—you know what I mean. The date on which you left me, last time. Next time, for you. I was much younger than you then. You will be, at last, the master in your own house. And you must be very gentle with me, David."

He smiled. "I can't imagine you were ever more lovely than you are today, Maria."

"In that case, I can think of a very good way to say goodbye."

This time, there was no disorientation. He fell asleep in her arms. When he awoke, there was nobody beside him, and he was lying on top of the bed, not under its covers. He looked around. The room was furnished, but bare of all its usual clutter. Everything was bright, freshly decorated. A slip of twenty years, he knew, would have taken him back to the time the place was built. Coincidence? Clothes hung beside the

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bed. He guessed they'd be a perfect fit. But there was no Maria to greet him, this time. Instead, a heavy, official-looking envelope, stuffed with papers, lay on the bedside table.

He swung his feet to the floor, sat up, and opened the package. He scanned the covering letter.

Something called the Timeshare Foundation owned the house in perpetuity, but he, David (he double-checked; they had his full name correct), his family and heirs for all time were appointed, if they so wished, to be its custodians. In return for looking after the house, he (and his heirs and etcetera) would be paid—he blinked at the figure—a substantial monthly allowance, plus approved expenses.

The rest of the package contained deeds, money, keys, official bits and pieces of all kinds. So *this* was Maria's mysterious foundation! The name was too appropriate though; who could have set it up? Maybe he had got back—would get back—to Roger after all. Given the money (and they'd have plenty if the time process really worked), it would be easy, all laid down in writing years or decades in advance, for the lawyers to leave this package on a certain table in the house on a certain date. The thoughts ran through his head while he dressed. Ten years, he reckoned he'd have this time. With secure finances, no distractions, he'd have time to really get to grips with the problem—even find a mathematician to pick up where Roger had left off. And, of course, he had to find Maria. She'd be in her early twenties now. Probably settling down to raise those kids that he'd seen as old men, what, a little over a month ago, in his time frame.

He was just straightening his jacket in front of the mirror when the door chime sounded. He smiled. It hadn't been changed in twenty years. But in spite of everything, he wasn't ready for the sight that met him as he opened the door.

It was, of course, Maria. He should have guessed. More beautiful than he had ever seen her, standing, uncertainly, on the step. In her left hand she held an envelope, very similar to the one now lying discarded on his bedside table.

"David?" In all their greetings, this was the first time she had sounded so uncertain. But she still knew him! They had already met, in her time frame, even if not, obviously, on the terms of their last meeting in his memory. Her last words, as they drifted off to sleep, came back to him. "Be gentle." He resisted the impulse to step forward and sweep her in his arms.

"Maria." He held out his hand. Relief showed in her face. She rushed forward, and hugged him, like a long lost brother. She was, he guessed, ten years younger than he; last night, he'd been ten years younger than her. Would the crazy ride never stop?

"Oh, David! Where have you been? I got this letter, and it said to meet you here, but after all these years . . . and I watched this house being built, and used to remember how you took me to play in the park opposite, but I never guessed, and, and, oh, David! Never go away again!"

He disentangled himself, choosing

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words carefully. "I didn't know I meant that much to you."

She pursed her lips in an expression of mock disgust, and punched him, playfully, on the chest. "You thought I was just a kid, I know. I used to dream about you, David. I planned to grow up and marry you. And then you went away, just like that. I cried for a month."

"Maybe," he picked a way carefully through the potential minefield, "maybe I was too old for you, Maria. You need somebody more your own age."

"You don't look too old to me, David. If anything," she leaned her head, bird-like, to one side, and examined him carefully, "if anything you look even younger and more handsome than I remember. Better than all the empty-headed young men around here, that's for sure. *And*, I'm big enough and old enough to hold on to you, now that you're back." She emphasized the words by slipping her arm through his. Suddenly, David saw her as the little old lady he had first met, taking that same grip on his arm. *This* Maria had, clearly, waited a few years for him; *that* Maria would have decades with only her memories. Something very special must have happened—be about to happen—between them, for love to last that long. Words came drifting back: you'll know how much it means to me that this was your first time. And Maria's first time, he realized, would be—had been—with him. But not just yet. There was no need to remember her other words. He would, indeed, be gentle, and make sure that the best was yet to come.

"I'm staying, Maria. For as long as I can. If you think so much of me, it's the least I can do."

"Meaning you'll only stay to please me? Don't you want me here, after all?" The familiar mischievous look was in her eye. "So why did you get this mysterious foundation to drag me along here? C'mon," she hauled him towards the door, "the sun's shining. Take me to the park, and tell me all about it."

He did not, of course, tell her everything, then or later. They had ten years, he knew. Time enough for the story to emerge when she was mature enough to have it. When he found a thick, brown ledger on sale at an office suppliers, he knew how best to tell the full tale, and he wrote down everything she would need to know carefully, by hand, as the months and years went by. Somehow, he never did get around to probing the mystery of his timeslips. Their life together was too precious to waste in fruitless pursuits, and the existence of the foundation showed that somebody, somewhen, was looking after things. Even if the foundation was impenetrable behind its legal walls, he *knew*, from first-hand experience, that it would continue to look after Maria and her family long after he was gone.

Of course, he tried to prepare her for his departure. It would be harder for her, this, the first time. And he, too, was stepping off into the unknown, after almost a decade of domestic security. The children were too young to understand, and would grow up hardly knowing him—which, undoubtedly, would explain their slight embarrassment when he had first met them.

On the last day, the boys were sent

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to visit their grandparents. David left the brown book, the longest love letter ever written, for her to find on the familiar bedside table, and went, at Maria's insistence, on a last walk in the park, in spite of the chill October breeze.

"I have to see you go, David," she had explained, "or I won't believe it is real. You would never leave me of your own free will, my love; that I know. But it is such a strange story, even after all this time."

He held her tight against the wind. Leaves blew past as the trees began to prepare for winter. "And yet, you will be happy. I have seen your future, and I know. A long life, surrounded by your family. And you will even see me again. The next time we meet, you will be older than I am now; but I will be the same handsome youth you married."

She smiled, slightly, and wrinkled her nose. "And will you—did you—still fancy me when I am fat and forty?"

"Yes I did, and no you weren't—fat I mean. Just you wait and see."

"I wish I could come with you, David."

"You said that to me before, in your future. But you *will* be there. And you will make a confused young man very happy."

The familiar smile returned, lighting up the mischievous eyes. "And knowing you, I know what *that* means. Where did you ever learn such things! Oh, I do so want to believe you will still feel that way about me, David."

He'd forgotten how disorienting the timeslip could be. He staggered, and sank down on the grass before opening his eyes. Same place, but no Maria. The house was gone—just an empty lot across from the park. It was early morning, but certainly not October. Still summer.

"About time, too."

It was a man's voice. A hand reached for his from the right, helping him to his feet.

"I thought you got here earlier. Doesn't leave us much time just now. Can you walk while I explain a few things?"

He nodded, not really surprised to be met yet again by someone who seemed more in control of the situation than he was. The man was about his height, but heavier and older, with a full beard. Well, fashions change, but you'll never get me growing hair like that, thought David, irrelevantly, as he was hustled towards the path. His guide was talking fast.

"You were right about the slip pattern changing after this jump. We're in a state now where the time spent going forward at the normal rate almost balances the slip back. You're in a kind of hysteresis loop. You get about seven years here, then you slip back a little more than seven years, and so on. That's how I was here to meet you. I've written it all down," this said while thrusting a small envelope into David's left hand, "and I'll meet you back here a week from now. We can sort out all the details then. But first, there's somebody else you have to meet."

David stopped. "Hold on. This is too quick. You know all about the timeslips?"

"Of course. Who do you think I am? You're not on your own any more. Between us, we can set the whole thing

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up for the family. All you have to do is remember a few things—fashion trends, new inventions, the general drift of the stock market. Then, next time around, which is now, I'll be able to lay the basis of our fortune."

"You're *me?*"

"Of course. Look, we really must hurry. There's somewhere you have to be by eight."

They started walking again. David, dazed, glanced sideways at his companion. That's me? He was still talking.

"There's money in that envelope. Enough to see you through the week."

"Hold on." He stopped again, then started walking as the other carried on without him. "How many of us are there in this, uh, hysteresis loop?"

"You don't want to know that." He thought about it. He didn't. Knowing how many loops to live through meant knowing when it would end—when he would die.

"I decided—you decided—each time we meet ourselves on arrival, for a detailed briefing. You get yours next week, because you have something else to do now. Then you're on your own, except for drawing funds from the account. Next time round, you'll be me, and so on. One day, you'll slip back and there'll be no one to meet you. Then, you really will be on your own. This time round, you'll have enough on your mind, believe me. Just concentrate on remembering the trends, and leave us to do the real work and set up the Foundation."

"*You're* the Timeshare Foundation?"

"So are you. We're all in this together. But I'll give you the full briefing next week. Here we are. You'll know why it's so important in a few minutes."

They were standing outside a large, but otherwise ordinary, house. David could see no reason for the impatience of his counterpart, but he was still being urged onward.

"Listen, uh, David," using the name clearly unsettled him; maybe he was nervous, too. "You remember what it was like the first couple of times. Everybody knew what was going on except you. It's like that now. Do what I say, and everything will turn out fine. I *know* it will, because it did. The family here has a big house, with a separate apartment on the top floor. They've got young kids, and they need some extra money. So they're going to let the apartment. They are going to let it to you. All you have to do is walk up to that door and tell them you've come to see it. Then everything slots into place. But do it now."

He gave him a firm push in the direction of the steps, and turned, walking off briskly down the street.

Someone round here is crazy, thought David. But since everyone round here seems to be me, I'd best go along with it.

He rang the bell, and was answered by a woman of about thirty, wearing a light top coat.

"I've come," he felt decidedly foolish, "about the apartment."

"Oh, yes, of course. I'm very sorry, but I have to take my daughter to school right now. But my husband will show you around." She leaned back into the house. "Dick, honey," there was an indecipherable response, "it's someone to view the apartment. Can you handle

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it?'' She turned back and smiled at him, just as a thunder of feet on stairs heralded the arrival of a little girl, about seven or eight years old, dressed for school.

''Hi mom.'' She turned to David. ''Hello. I'm Maria. Are you coming to stay with us?''

It was going to be a long seven years. ■

ON GAMING

(Continued from page 79

tache—to blend in.

Zak's first encounter with them is when he enters the phone company and we see who's behind the counter.

It isn't long before Zak is stocking up on perhaps-useful goodies like wet suits and a golf club at the pawn shop, and jetting away to a dizzying array of locations. Zak can arrange to travel everywhere from Cairo to the Bermuda Triangle, with a half-dozen locations in between.

But not only that. There are two coeds exploring Mars, and Zak becomes mentally linked with them. The player can then switch between Zak, the coeds, and another ally on Earth. The coeds discover an enormous face and a massive building that can be opened only if some oversized buttons are pressed in the proper sequence. That sequence can only be learned from a golfing witch doctor in Zaire. (Aren't you glad you brought that golf club along? And I had to watch that native dance more than a few times before I caught on to what the clue was.)

Zak is filled with bright ideas. The commands are more than adequate to cover all contingencies. The program uses different ''camera'' set-ups. Some scenes on Mars adopt a long perspective, for example when the Martian tram travels to the Sphinx. Unlike *Maniac Mansion*, you start with one character but you gradually meet accomplices (on Mars and on Earth) who can help you turn off the stupidity machine. If Zak finds himself strapped to the machine, he starts losing his commands one by one, until he's left with just the one word command, ''Walk.''

Games are easily saved, except when you're in the middle of certain sequences.

My colleague commented that Zak controls your actions more than Maniac, and I guess that's true. It spans the planet and the solar system, but your options are more artificially limited.

But the scope, the humor (there's even a copy of *The National Inquisitor* included, loaded with clues), and the sheer fun of *Zak McKracken and the Alien Mindbenders* make it an instant classic. ■

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a calendar of analog upcoming events

27-29 January 1989
BOSKONE XXVI (New England SF conference) at the Marriott & Sheraton Tara, Springfield, Mass. Guest of Honor—Tim Powers, Official Artist—James Gurney, Special Guest—Tom Whitmore. Registration—$25 until 31 December 1988, $40 at the door. Info: Boskone XXVI, Box G, MIT Branch Post Office, Cambridge MA 02139-0910. (617) 625-2311.

3-5 February
CONTABILE (U.K. Filk-singing convention) at Chequers Hotel, Newbury, Berks. This is the first filk convention in Britain. Registration—£12 attending (may increase), £5 supporting. Info: Contabile, 7a Mill Road, Cambridge, CB1 2AB, U.K. Please enclose sufficient International Reply Coupons for airmail response.

10-12 February
CONTINUITY (Alabama SF conference) at Holiday Inn Medical Center, Birmingham, Ala. Guest of Honor—Andrew Offut, Artist Guests—Doug Chaffee and Frank Turner, TM—Dal Coger, Comics Guest—Bill Bryer. Registration—$15 until 15 January 1989, $20 thereafter. Info: Continuity, Box 550302, Birmingham AL 35255-0302. Include S.A.S.E.

17-19 February
WISCON (Wisconsin area SF conference) at Holiday Inn Southeast, Madison, Wisc. Guests of Honor—Gardner Dozois and Pat Cadigan. Registration—$15 in advance, $25 at the door. Info: SF3, Box 1624, Madison WI 53701-1624.

17-20 February
SERCON 3 (Literary-oriented SF conference) at Hyatt Regency Hotel, Louisville, Ky. Featured guests—James Gunn, David Hartwell, Richard Powers. Registration—$35 until 15 November 1988, more later. Info: Sercon 3, Box 1332, Dayton OH 45401. (513) 236-0728.

24-26 February
CONTEMPLATION (Missouri SF conference) at Ramada Inn, Jefferson City, Mo. Guest of Honor—Mercedes Lackey, Artist Guest of Honor—David Lee Anderson, Fan Guest of Honor—Tom Meserole, DJ—Dell Harris, TM—Kevin Randle. Registration—$12 until 15 January 1989, $15 thereafter. Info: Contemplation, Box 7242, Columbia MO 65215. Include S.A.S.E. (314) 442-8135.

24-26 February
FS/1 (Central Kentucky SF conference) at Lexington Hyatt Regency and Radisson Hotels, Lexington, Ky. Registration—$20 until 31 December 1988, $30 thereafter and at the door. Info: SEDS-FS/1, Box 979, University Station, Lexington KY 40506-0025.

31 August-4 September 1989
NOREASCON III (47th World Science Fiction Convention) at Sheraton-Boston Hotel & Hynes Convention Center, Boston, Mass. Guests of Honor—Andre Norton, Ian & Betty Ballantine; Fan Guest of Honor—The Stranger Club (Boston's first SF club). Registration—$60 (adult), $40 (child) to 15 September 1988; $70 (adult), $45 (child) to 15 March 1989; $80 (adult), $50 (child) to 15 July 1989. Supporting—$20 at all times. No advance memberships after 15 July 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Noreascon III, Box 46, MIT Branch, Cambridge MA 02139.

—Anthony Lewis

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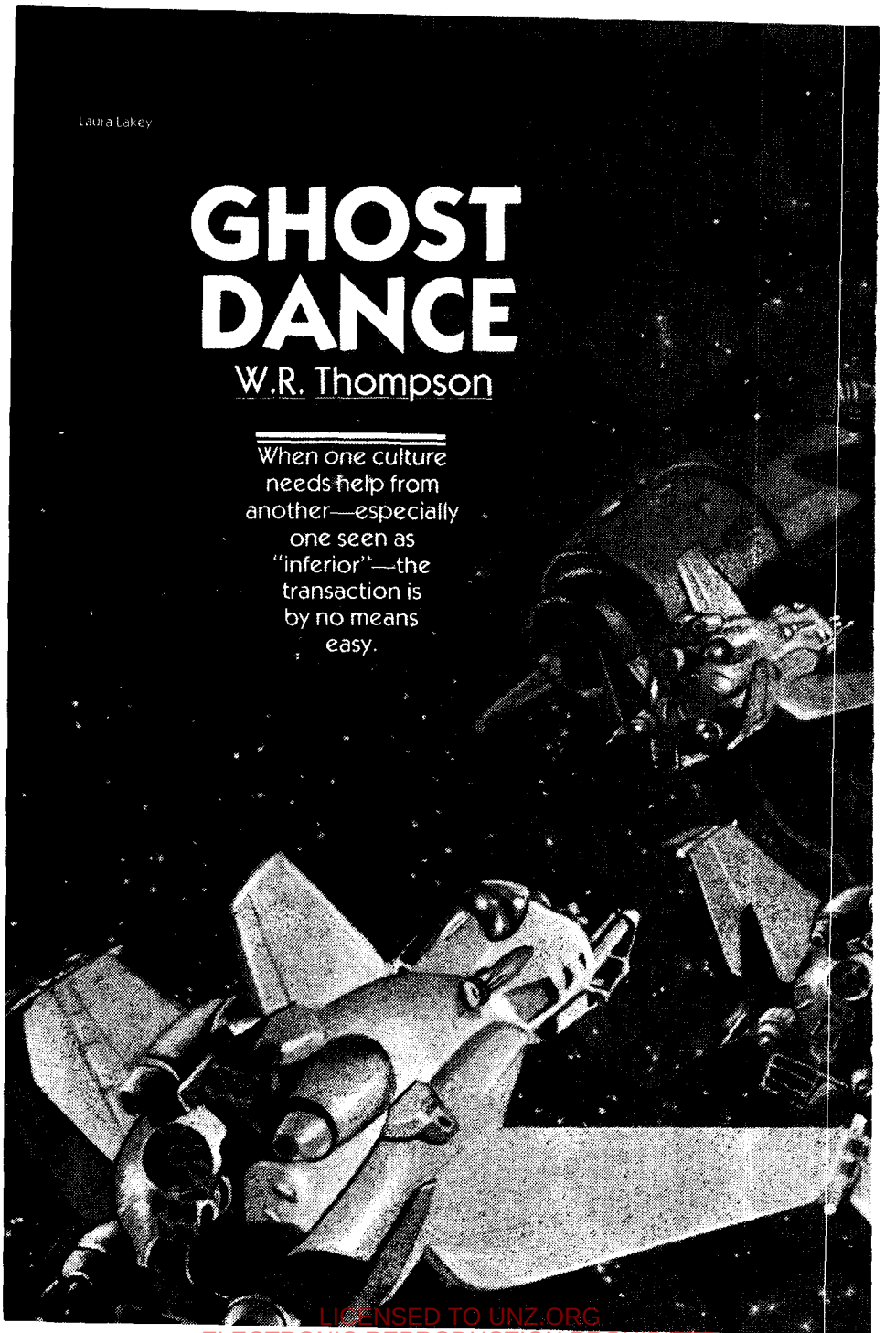
Laura Lakey
GHOST DANCE
W.R. Thompson
When one culture needs help from another—especially one seen as "inferior"—the transaction is by no means easy.

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They hate me. They are the human, and they hate me.

Forty years ago, a damaged ship named *Scented Vine* came to their planet. While the automation affected repairs to the damage, the crew played tourist on Dirt/Ground/Earth. Human society was in an advanced state of decay at the time; in odd synchronicity with galactic society—odd because *Scented Vine* represented the first human contact with civilization.

There is evidence that *Scented Vine*'s crew played a role in the final stage of human society's collapse. Some human maintain that the crew caused the collapse, playing on weaknesses and strains in human culture. Had *Scented Vine* never appeared, they claim, the human would have overcome the disunities cursing them, and gone on to achieve technical and cultural heights as-yet-unknown to their race. Even those who concede that the crew of *Scented Vine* did not engineer the collapse hold that they triggered the disaster.

I am almsot. Hence their hatred, even though I am here to help them defend their world, training them as I have trained others.

Their world, the greatest prize in once-civilized space. From orbit it looks quite beautiful, as do all habitable planets. Primitive; no visible structures in orbit, in fact, nothing synthetic in its space save defunct satellites and the Institute scoutship. Before landing I spend several days in orbit, fasting and meditating, seeing the not-extensive ruins left by the old society, seeing the dim nightglows of the renaissance region. Here as everywhere, everywhen, the growth of technology accompanies the growth of decency/civility/grace.

Here, then, is the prize. Throughout the galaxy entropy increases. Violence, greed, willful ignorance, all the things abhorrent to civilized almsot, rise and are accepted. Commerce and scholarship fade. Only *here*, on this one world, do any strive to resist the decay. Somehow we almsot must follow the human example and reacquire this striving.

There are those who would prevent this, who would permit the night to fall across the stars. I have come here to stop them, if I can.

And if the human will let me.

My first meeting with my students goes poorly, I judge. They have been brought to Capital City, the focus of the renaissance, when my ship enters Ground(?) orbit. Thus they have had to wait many days before I land, and they grow impatient.

"Not impatient," Dzhaz tells me. The head of our embassy to the human stresses this point when we meet in the embassy enclosure. "They are offended. They think you kept them waiting to display dominance."

"To what end?" I ask. "Delay, insult are not in our interest, Excellency. All know that time presses on us."

"I have told them this, Enlightener. The fact remains that they take offense. It is a human trait to demonstrate social dominance through tardiness. They tolerate the behavior in themselves, but they resent it in us."

My emotions depress. "They assume that we share this trait with them? Excellency, have you recruited microcephalics?"

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"Certainly not. You are to work with the best, as defined by your own parameters. Advice on working with them, Enlightener. Do not place complete trust in translators. Our understanding of their more-than-one language is incomplete."

"Noted, Excellency." That point has already troubled me. "Then they do not all speak the same language?"

"A condition typical of young races."

"And they call their planet 'Dirt'?"

"That is one possible translation of name, although it offends them. It is an inefficiency of the translators, best avoided by calling this 'your planet.' "

"Many thanks, Excellency. Now I would meet my so-offended students."

We don environment suits and leave the embassy. I bear in mind that such suits are not perfect, that a failure could expose this biosphere to disease, disaster. Such has happened elsewhere. Should I loose a plague on the human, we will lose the unique factor which must save us from our collapse—

But that thought is unworthy. Their right to existence is not dependent upon almsot needs, my conscience reminds me.

I have seen illustrations of human, so I am prepared to meet my students. At first appearances overwhelm me: bipedal, heads on swivel-necks, dry night-black skins, graceless angular limbs. Vegetable-matter fabrics cover them, garments which bear various symbols. I judge the symbols on their upper-left torsos to be name-tags. Happily I will not need to depend on these, for before Ambassador Dzhaz finishes presenting me I become conscious of individual distinctions: size, facial structure, hair patterns, and the like. Uniqueness asserts itself as always.

If they are impatient, either they or my translator hide the fact. One of them, a male wearing a different style of garment, greets me in a formal mode. Their planet needs my wisdom, he says. Both their world and ours will benefit from cooperation. The students are eager to learn. He invokes a pagan deity to help us inflict death on the dangerous ones.

"Enlightener, please show no offense," Dzhaz implores over our private link. "Many apologies for my error, but I did not think he would speak thus."

"I take no offense," I tell Dzhaz. "It is best that I learn the extent of their darkness."

I take my turn at speaking, first giving half-hearted thanks for the greeting, then turning my attention to my students. "I have spent my time orbiting your world, meditating upon the situation," I say. "I am honored to share in the duty of protecting you, in helping the cause of civilization." I pause, and begin my duties of instruction/enlightenment. "You have questions to ask me."

They do, signaling them by raising arms. The first one comes from, if I am correct, a female. "Unit-ruler," my translator clicks in my helmet, "When will we and the dangerous ones exchange death-force?"

I trust that the terms stem from translator error. "My estimate is that we have six to eight of your months before the first danger appears. By then the most suitable of you will have achieved full expertise in defense."

Another female, another question. Her stance indicates challenge, defi-

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ance, Dzhaz notes. "Why train us? Why not bring in your own death-force experts?"

"They are coming," I state. "And they are the dangerous ones you must stop."

With utmost reluctance I begin their pilot training at once. There is no time for proper enlightenment; do everything properly, and they and their culture will die before I can finish. Yet by teaching them the unenlightened use of death-force tools I may assure the eventual destruction of their culture, and more. The social mathematics make this plain. Some of the factors are odd, but no amount of number-juggling can change the truth.

I confess my weakness: I have made the choice which delays the destruction. I tell myself that I gain time for them, that if they survive they may yet reach enlightenment. Even so, my conscience is strained, the enhancer resisting my logic at every step, threatening to damage my sanity.

Do the lessons go well? Yes, in certain ways. All the students develop piloting skills with ease, and learn how to point tools at other spacecraft. Unleash them and they will work wonders in conflict. I see every day how they enjoy the mock conflicts of simulator training, baring teeth and making noises as they work controls—behavior which reveals their low state of evolution.

Here, then, is the danger. When they defeat the dangerous ones, they will become heroes to their race. Protectors of order, of stability, their actions will set an example that others will follow. Should my students revel in the barbaric side of their duties, should they give in to the obvious, easy temptation to kill without need, they will lead other human to behave this way.

It is a resonance phenomenon, a basic fact of social mathematics. We model our actions on those we admire—and violence is a dangerous model for social behavior. Its use is inevitably accompanied by distrust of others, by contempt for the physically weak, by the misbelief that something which works in one situation will work in all situations. The cult of violence is antithetical to the fabric of civilization.

I play with dangerous forces here. Almsot culture must resonate with human. Yet the human are only slightly more than savage; the almsot follow a road back into savagery. Should we resonate with their barbaric side, our collapse will accelerate.

Their planet warns me against the dangers I risk. Earth(?) is less developed than any other inhabited planet, yet paradoxically the devastation of collapse is greatest here. Entire cities stand abandoned, or inhabited only by scavengers. Outside of the civilized region, the human are reduced to savagery. Such may yet happen everywhere.

Against this stands my work. I study their language in the hope that I may teach them in it, but I cannot learn to think in it, to comprehend it in real time. The sounds alone are enough to defeat me; the human speak by expelling air through a chamber in their necks, and I find it hard to distinguish their wind-sounds.

Dzhaz assures me this can be done, that it even has some facility for this. "They place much emotional informa-

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tion in their words," it says as we confer in the embassy bath. "Variations in volume, pitch, stress often define the value of a statement. Some of their art forms make use of this."

"Indeed?" I grow excited, enthralled. Who could expect this? Diversity always surprises. "Would it be possible to hear examples?"

"Examples are on record, with annotations," Dzhaz says. Its mode of address bespeaks pride. "The annotations are my own, and I feel are most reliable, especially in view of the alien nature of the art form."

"I anticipate double enjoyment, Excellency." I am reminded that it is by profession a scholar, in itself an art form. Thirteen years ago it came to this planet to study its collapse, but made the discovery that they were recovering from their disaster. Its brilliant study of this world alerted civilized space—such as it is—to the course of events here. Its treatise on human culture gave hope to some, alarm to others, and made inevitable its permanent return to this world.

Enjoyment/comprehension must wait; at this juncture I am called to the training compound. The ambassador offers to join me in answering the call, which comes at an unusual time. We don environment suits and depart.

My students live in a harsh, barren structure, suitable for meditation. It is a place of flat surfaces and sharp angles, of a solid floor and dust-dry walls. The interior is quite dark, lit by a feeble red glow from electric lamps. The windows are covered with silicon dioxide plates, not transparent to visible light. Human eyes see in our infrared light (although I conjecture they would call our visible light "ultraviolet"), so the structures are well-lighted for them, and Dzhaz says it either amuses or puzzles them to see almsot visitors cope with the (to us) dark.

I find trouble. A group of my students cluster around a spaceship simulator, in postures of agitation and distress. "We have studied conflict-engagement simulations," one says. "End results of all engagements fail to include death of opponents."

"Your study is correct," I tell him. "What is the problem?"

"Our deity-condemned dangerous ones are not harmed. Our deity-condemned death-force tools are pretend-devices."

I listen, both to the translation and his own incomprehensible voice, which Dzhaz informs me contain an extreme negative emotion, more appropriate to one engaged in death-force conflict than in discussion. Thus I note that this student is not suited for further training. "Devices are not pretend-devices," I tell the group. "You will operate spacecraft equipped with these tools. They will behave precisely as do simulated tools."

Consternation strikes my students, evident even without Dzhaz's commentary. "Then they will behave as pretend-devices," a male states.

I surmise there is a translation difficulty, and say so to them. "The tools in your spacecraft will deactivate the main power sources of opposing spacecraft. Drives and controls will fail. You will then recover both opposing spacecraft and crew."

"What happens then?"

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"We will confiscate craft and adapt them to defend your world. We will return the crew to their home planet—"

Incredible! In an affront to communication, discipline, I am interrupted by untranslatable statements. Dzhaz listens, informs me that the human expect conflict to end in inflicted-deaths of opponents. Shock greets the idea of avoiding injury to opponents.

This upset is expected, a necessary part of enlightenment. I explain that the purpose of conflict is to preserve society against destruction, including self-destruction through moral decay. Needless death-infliction is a sign of such rot. To win it is only necessary to temporarily disable opposing spacecraft, then deprive opponents of ship and death-force tools.

This is questioned at once. "What will prevent dangerous ones from returning with new ships and death-force tools, plus motivation to satisfy untranslatable emotion?"

I wonder at the concept which makes the translator balk. "Both ships and death-force tools are expensive, difficult to obtain, difficult to fabricate, most especially now that society and industry are in decay. It is impossible for opponents to present danger without tools. Should any obtain more and return, then you will stop them again."

"Inflict death on the sexually-active canine-descendants," one suggests. "Prevent their return, also warn other dangerous ones against attempting similar activities through their example."

"Dangerous ones seldom heed warnings," I say. "They always believe themselves immune to danger, able to surmount that which overcomes others. To set examples for such is pointless."

Dzhaz wearies of the debate and leaves. My students and I discuss the topic of inflicting death on those who will endanger their world. They become insistent. They advance irrelevancies and questions I cannot answer, and none of us can convince the other of our rightness.

I am troubled, although I know persuasion is not the goal tonight. Over the next few days several of my students will resign. The ones who remain may show the aptitudes I need. Even so, I despair of enlightening this race.

I return to the embassy, shed my suit and moisten my membranes. Dzhaz rejoins me. "You found communication difficult," it says.

"Indeed I did, Excellency."

"At times you needed an entire sentence to approximate concepts they sum up in a word," the scholar-ambassador says. "And many of the words you utilized were imprecise."

"As you say." Despair, depression fatigue me. I have always considered myself a sophisticate in matters of death-infliction. Have I not seen almsot end the lives of other almsot? Have I not studied all we know of conflict, and intervened to end several conflicts? Yet compared to the human I am woefully/laughably ignorant.

The ambassador lounges next to me, its mode showing sympathy for my distress. Having dealt with the human for so long, it must be well-acquainted with my feelings. "As a scholar, I once thought that, should a race lack words for a concept, it must needs lack the

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concept itself, lack also the talent to perform acts described by the concept.

"Then I studied the human. The concept we vaguely describe as inflicted-death can be described in hundreds of subtly different ways here. Their words can describe the act done by various intentions, by different parts of the anatomy, by esoteric tools and techniques."

"This fails to cheer me," I understate.

"You think I merely remind you of their unenlightened state," the ambassador says. "I also remind you that we do not have their multiplicity of words for inflicted-death. But we do have those who pervert tools into means of inflicting death, who do not hesitate to use such tools. Their acts show expertise even while they stumble to describe their deeds."

I see its line of reasoning. "And should such acts become commonplace, we will make words for them."

"Statement of fact." Its mode shows meditative thought. "To enlighten them, to fully succeed in your mission, you should observe their most primitive thought patterns. Such display is most clearly the foundations of human culture."

The ambassador gives me library listings for translated human literatures, plus translation lexicons for specialized words. It urges me to absorb and meditate upon the lexicons before reading the translations. Then, as an afterthought of kindness, I am given listings for native arts.

In three days fully half my students resign. Resignations are to be expected, but I feel dismay at the number I lose so swiftly. This can only mean I am doing something dreadfully wrong.

The resignations cause annoyance for the ambassador. "The native rulers do not like what the resignees report," Dzhaz states. "They state that we do not wish to defend their planet."

This distresses me, but the ambassador shows confidence. "Do not concern yourself, Enlightener. I have assured them, that your methodology is designed to remove unsuitable candidates, an explanation they accept. To further assure them I have presented them with the defense spacecraft your ship brought here. This symbolic act delighted them."

"I hear," I tell the ambassador, and return to my meditations.

In truth, all Dzhaz says adds to my melancholy. I had not expected so many of my students to prove unsuitable. Soon I may lack the number deemed necessary for combat. And who can take delight in receiving weapons?

Weapons. Combat. These are words in the human-almsot lexicon. The lexicon pattern is to give a human word, then a definition/explanation, and then a synthesized almsot word. I program my translator to utilize these words, although they are many. War. Crime. Revenge (the term which confused my translator). Murder, rape, homicide, strangle—I hope I will not need them often.

At first the human arts shock me. I view and hear recordings made before the local collapse, in which war, murder, and torture became art forms. One would think their arts exist only to serve as propaganda, another of their words.

Yet the word itself gives lie to the

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concept. If art can be propaganda, it can also be not-propaganda. I search the library systems, finding art forms and lexicons not mentioned by the ambassador.

I experiment with the audio arts. Instruments make noises in pleasing, mathematical patterns. Voices speak, sometimes without meaning, sometimes with profound meaning, always expressing emotional information. I listen, in part to learn how to discern emotions through this mode. Annotated transcripts tell me that one song describes the happiness of being needed by a reproductive partner, while a second tells of a human who exists with a little help from his friends.

I contemplate the listings Dzhaz gave me. I find it improbable that by accident Dzhaz would give such a biased view of the human. To apply a human word, I suspect the ambassador.

This motivates me to shift my quarters out of the embassy and into the students' compound. The ambassador is perturbed by my decision, which it calls precipitate. It assures me that my presence will have a negative effect upon the students. "Fear of us is instinctive with them," Dzhaz states.

"Paradox, that they could evolve instinct for that which they have never known."

"No paradox, Enlightener. In human evolutionary experience, danger comes from the unknown, the different. Only that which is familiar is safe." Its mode shows the deep thought the ambassador has given this topic. "I speculate their society fell because they feared the changes it underwent as it developed. Long before the collapse they resisted all manner of change, irrelevant to size, benefit, necessity."

I accept this even as I continue to suspect the ambassador. I perceive that it becomes even more important for me to reside with my students, to *force* familiarity upon them. Indeed, when I move my utilities into an empty room in the student facility, they observe me with tentative interest. They do not know that my translator picks up their private comments, thus informing me that to some my presence is other than pleasing.

I recognize I have things to learn from these students, things in addition to understanding them. To this end I inform them that I am available for discussion at any time they require me. I consider telling them to disregard my privacy, but I realize they will do so in any event. I settle into my quarters and listen to a song about a friendly amphibious creature.

Already I make progress, for within moments one of my students enters the room. Although darkness inconveniences me here, I douse my lamp; visible light, I am told, does injury to the eyes and skin of the human. "I have questions about the coming attack," she says. "What motivates the enemy?"

"They wish to destroy your culture," I tell her.

"Failure to comprehend motive," her translated words say.

"You are aware of your importance; by studying you, we hope to stave off our own collapse, rebuild civilization. Crush you, same reason, and there will be no restoration."

"No law," she says, "No police, no court, no safety. They can take a section

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of space for their own use, rule it as warlords."

I hesitate before answering. The human concepts are not identical to ours, but the essence is correct, and I say so. She does not seem pleased to have found the answer—can I blame her? It is clear she expected better of galactic culture. However, she presses forward. "Is there a way to negotiate with attackers?"

"Experience proves attackers negotiate in bad faith."

"Statement of regret. Perhaps display of force can dissuade attackers without direct combat?"

"That is one tactic we will employ." For a while we discuss potential tactics, with the stated goal of achieving victory while avoiding the risks of combat. She states she has no interest in sparing the lives of attackers; pragmatism dictates avoidance of danger if practical. In spite of this attitude I note her as a prime candidate for enlightenment.

I take my students to inspect their spacecraft, and once again I lose half of them.

The spacecraft rests in a hangar, an unnecessary luxury constructed to please some human esthetic. An Institute technician instructs its own students on how to maintain the spacecraft. A sign of the galactic collapse: this lone technician represents an irreplaceable asset, and its presence on this planet is a major drain on Institute assets.

My students view the craft (I will not call them fighters) with mixed emotions. Of significance is their concern with the suppresser systems. I explain again how they disrupt electronics and cybernetics within a limited range, and now I go into detail on the physical theory behind the suppresser effect. Binding energies, quantum numbers, transition states—I reveal all.

Their intellects are keen; at once several spot ways to pervert this system into a killing weapon. I am not fool enough to deny this possibility. After all, it is the most common style of weapon fashioned by our growing outlaws. I have known that this option would occur to them, and I prepare to dismiss those whom I judge would use it in combat.

Yet it is not this which causes the defections. We return to our barracks, where I am delayed by the ambassador. My students return to their studies, while the ambassador confers with me in my quarters. It invites me to return to the embassy enclosure, where I can remove my environment suit and enjoy comfort. I decline, an eventuality I know it has expected, for it has fetched along several human-produced books for my benefit.

I accept the books with suspicion. "These have significance?"

"Statement of fact, Enlightener. They deal with human belief systems, hence give insight into their mentalities. I am uncertain that you have assimilated them, recognized importance of admittedly distasteful axioms."

I thank it and it leaves, invoking the press of business. My suspicion grows. I have read the books, of course, which are filled with paganisms. Deities appear, reveal axioms, sanction crimes, suspend laws of nature. Yet these absurdities are to be expected of a young race, and at the same time the theologies contain signs of growing enlightenment.

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Indeed, we almsot were much like the human at the start of our history, a thought which comforts me. They can rise as we did.

Moments after Dzhaz leaves, I am visited by several students. At first I expect them to discuss using suppresser systems as weapons, but another matter troubles them. "The ambassador has spoken to our political leaders about our training," a male says. "It is clear that your purpose extends beyond combat training."

"It does," I agree.

"Precisely as deduced," another says. "You choose those who are submissive. Purpose, to assure political leaders that we will not threaten their ascendancy, eventually displace them."

"The ambassador has said this?" I ask. I look, see other students crowding outside the door to my quarters.

"Yes," I am told. "In addition, all evidence supports the ambassador's admission."

"Then you lack evidence," I tell them. "Despite claims of the ambassador, I anticipate you will play paramount roles in human, galactic societies. My goal is to prepare you for this role as well as for combat. Undesirable, to defeat attackers/brigands, only to have students assume their roles."

I observe the mixed pride, apprehension with which they learn this. Pride in future importance, apprehension at how they will handle such responsibility—their feelings are appropriate. My own mode is apprehensive; the proper path of enlightenment would have led them to discover this themselves. Dzhaz's machinations have deranged my plans, to what degree I do not yet know.

I would listen to more songs now, but several of my students remain, and their modes show the relaxed friendliness I have tried to cultivate in them. One is my female potential-leader, whose name translates as Beautiful Barrelmaker. I verify the translation, and mention that almsot eventually renamed our homeworld "Beautiful" after we achieved starflight. This is appreciated, and I recall the ambassador's comment upon their planetary name.

We discuss meanings of names. I discern that the literal translation of Beautiful embarrasses my prize student, while the translation Barrelmaker amuses her. I find some names are given to honor elders or heroes, some are given for euphonious effect, and some have theological significance.

It is this point which begins the disaster. They mention alleged deeds of some of the theological namesakes. Then a student sees my books, identifies one as theological, advances a tentative question. How do I regard this cult? The enhancement to my conscience demands honesty, while my mission demands restraint; the two forces balance in a bland caution. There is much to admire in the cult, I state, and cite concepts of mercy, self-sacrifice, honesty.

They express agreement, and it develops that none claim devotion to any creed. They question me on almsot theology, and at first they are amused. They find it incongruous that a species older, more technological than theirs, would maintain a cult.

My blunder: I grow too assertive, too detailed in defending my belief system. The omniverse is a created thing, designed so that intelligence may evolve.

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The deity exists, but reveals itself only through the workings of logic; we are given intelligence and our senses in order to discern the purposes of the deity, to build theology upon what we learn. These are beliefs, I concede, not facts, but who does not treat beliefs as fact?

We discuss concepts. All sapient beings desire to understand the omniverse and escape uncertainty, and this gives rise to the religious impulse. The ultimate validity of a theology cannot be proven. It is desirable to reach a state of enlightenment, to do no harm to others, to choose good over evil. And so forth.

One student grows incisive. "Does your theology motivate your reluctance to inflict death?"

"In part." I hesitate. To the human, theology and science are not necessarily in harmony, are permitted to contradict, another of their heretical concepts. How can they expect such incompetence in the deity? This hampers communication. "Social mathematics prove the danger of brutality, violence."

"And these mathematics coincide with theology?"

I agree. "It is absurd to think that a sensible deity would allow the two fields to conflict. Do not theology and science both describe the same universe? Should theology ignore reality?"

The translator leeches force from his words, but by simultaneously listening to his own voice I sense the emotional context. He is hostile. "You accept in full this theology?"

Again I agree, and add, "I am an adept, as my proper title, Enlightener, indicates."

"And you believe that it is necessary to enlighten those who do not share your beliefs?" he asks. The emphasis he places on *enlighten*—I recognize the human word-equivalent—is offensive.

"I would aid you in enlightening yourselves, but it is a process you must perform yourself."

"A process defined by almsot logic, not ours. You would make us into almsot."

I boggle. "Your statement is a logical absurdity, a heresy."

He is unmoved. "I see no point in defending our world from one group of almsot, only to see us destroyed from within by another such group. You engage in cultural imperialism."

This sentiment is echoed by other students. Throughout the night it serves as a focal point for argument. I count myself fortunate that many of my students disagree with this premise, and that Barrelmaker emerges as their leader. Nevertheless, when morning comes, there are many resignations.

I retain enough students to utilize all spacecraft twice over, so barring further losses we have enough pilots. Twelve pilots for six craft seems excessive/ inefficient, but there is cause. In combat some may die, and should we win we will salvage their craft, refit them, send others to fight and die in them. My conscience is in conflict over this, as always. Send pilots out and some will die; do not send them, and attackers will slay human as they please.

I find that Barrelmaker wrestles with a related dilemma. We are in my quarters, discussing nuances of songs. She uses a map to show me where some of the songs originated. Liverpool, New

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Orleans, Detroit, Montreal—sounds which baffle my translator. While I adjust it, Barrelmaker points out that these cities are abandoned. All are located in the no-longer-civilized zones, which are extensive.

Barrelmaker broods upon this. Civilization expands, yet certain areas resist. In these areas abound slavery, sacrifice of human to deities, war. Rulers strain and connive to keep their victims unenlightened, happy with barbarism, in fear of the civilization which would restrict the rulers' power.

She herself was born in such territory, as part of an extended family unit which grew food, some of which they traded to a warlord for protection. This protection proved inadequate, being useless against famine which killed several relatives, ineffective against slavers who carried off others.

While she was quite young the renaissance absorbed her area, family, taking them into the civilized region calling itself the Republic. Freedom, dignity, continued existence became the norm. She would extend these rights to others.

Here, then, is the dilemma. Do I consider it proper to remove warlords with force? While respecting my position, she cannot justify inactivity. Nor can I, I tell her, but the danger of violence is that it grows, becomes acceptable as the easy solution. It is applied more and more often until society tears itself apart. Rationalizations, euphemisms, official approval cannot negate the effects. Other means are required.

She states awareness of this, then points out brevity of human lifespans. Slow, cautious action leaves many to live in unjust state. To this I can offer only my subjective belief in avoiding violence when possible, circumventing it with intelligence. It is the reason I have enhanced my conscience.

I explain this to her. "I am a member of a religious order. Our tradition is to maintain peace. To this end, we must be familiar with tools and techniques of combat, just as a doctor must understand diseases, poisons, injuries. You can see that, should one of my order become a heretic, it could pose a danger to society?"

"I was about to comment on this," Barrelmaker says. "The eventuality seems inevitable."

"Indeed. As an act of commitment, members of my order have implanted in their brains a cybernetic device. Its programs assure full function of the conscience, making it impossible to ignore or circumvent our beliefs. There are conditions under which it denies us freedom of action."

"You could not kill to defend yourself?" Barrelmaker asks.

"No. Neither can I divulge knowledge of combat techniques and weaponry to those who would misuse them. More relevant, I cannot kill to defend you or others, or to prevent an undesirable event. These possibilities weigh more heavily than personal death."

Barrelmaker meditates briefly. "If almsot can make such a device, can you not give it flexibility?"

"Flexibility would negate the value of the enhancer, as the values programmed into it are not flexible."

It is clear that Barrelmaker cannot yet assimilate this. She suggests that the enhancer may allow me to escape the burdens of conscience by making my

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decisions for me, giving me an excuse for inaction when faced with conflict. Her mode is not vehement, but then she has always maintained an outward state of calm. I continue to discuss the enhancer with her, but I cannot say if she accepts my arguments.

Nor, suddenly, can I.

My students advance rapidly. They take their craft into space and practice combat maneuvers, with the Institute scoutship simulating a raider. They show equal skills at piloting and tactics, and with each exercise their skills grow. They disable their target, take it in tow, maneuver with it. The mock-raider fights back, and my students undergo simulated death with less and less frequency.

One point troubles me. A standard, effective tactic has the craft maneuver so that, as seen from their target, they appear to merge into one point and then separate. The purpose is to confuse a hostile fire-control system. At first the students refer to this dodging and weaving as "stunt flying" and "shooting the rapids," but it soon becomes known as the "ghost dance."

A "ghost" is a creature which has survived its own death, an event they know to be impossible. It is the reference to death that perplexes me. Do they expect this space dance to end in their own deaths, or in those of their attackers?

Or is there another meaning? It occurs to me that a dance is a form of resonance, and of course societies resonate with one another. Do they fear that resonance with us will destroy their culture, turning it into a ghost? I know that many humans fear change, and that even now our apparent superiorities injure their pride.

I do not annoy them with this issue, as I push their training hard now. I have no choice. A raider has emerged from infraspace, far sooner than anticipated. The scoutship detects the craft at once, and goes undetected itself as it queries the raider's crude cybernetics. It comes from a world which recently declared independence from the main political body of the galaxy. Should human culture provide the key to restoring civilization, this world will in time find itself reabsorbed by society. To forestall this it will bombard the human into extinction.

I inform my students today, in our training room. We have the advantage of knowing the raider's mission and capabilities. It will reach the planet in two weeks. Until then, the students will train in the simulators, which the raider cannot detect.

My lecture on the raider's armament (anti-meteor weapon, suppression projector, fusion drive) and maneuverability is interrupted. Several human and the ambassador enter the room and state that the situation has changed. My services are no longer required, the ambassador says over our private link.

"My duties are incomplete," I say, in a mode of disagreement.

"You have taught the human to fight," Dzhaz states. "Such was your sole duty."

"They remain unenlightened."

"As they must. Enlighten them, and they will lose the factor which gives them importance. Civilization will fail."

"They deserve enlightenment," I

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say. "What you say appalls me, Ambassador. The human are not made for our use. If our survival requires leaving them in the dark, I will not acquiesce."

"Enlightener." Its mode is that of one fulfilling a painful duty. "Do you know why the Institute selected you for this task, rather than an unenlightened warrior?"

"Trust," I say. I feel its mode is deceptive, as in a human actor playing a role. "Reliability. An enlightener will fight for unselfish motives. But had the Institute hired an unenlightened warrior—do you understand the human word 'mercenary'? One who fights for hire, yet often betrays or abandons its employers?"

"Irrelevant," the ambassador says. "The Institute could have found volunteers. In fact, had I any facility for combat—no matter. The Institute selected you because they fear that the human may some day achieve starflight, become a menace to almsot. Some fear this more than our own collapse."

"Is this a statement of fact?" I ask.

"I was privy to discussions. Of all options, one deemed safest by the Institute was to beseech an enlightener to train human warriors, teach them to fight while making them docile. I agreed, but knew that enlightenment would ruin human motivation."

"And thus you maneuvered to prevent human enlightenment."

"I chose the path least likely to contaminate, destroy their culture. They may be enlightened later, when it is safe."

Meanwhile, one of the human speaks to the students. I give partial attention to his statement, which mentions supreme crises, circulatory fluid and deities. It ends when he commands the students to follow him out of the training room. They do so, and I cannot guess what is now on their minds.

Three legs, three arms, heads properly set on shoulders, movements of fluid charm. I have spent so much time among the human that my own species look alien, a sensation which disconcerts me. I can look at the ambassador and understand why some human see in us an image of primal horror.

"I had no choice," the ambassador states as we doff our suits. "Social mathematics dictated my course."

"The equations do not govern individuals," I respond, in my most self-righteous mode. "The deity created the mathematics so that, by understanding the equations, we could find those moments when individual choice has significance."

This neatly defines our differences. The ambassador sees the equations as blind expressions of nature, to be exploited as desired. I see them as a tool to find these crises in which we may control our destinies.

I visit the library unit and search files. I find the record of the Institute discussions the ambassadors mentioned, but much has been erased. I look for subtle clues, indirect evidence of the talks—and find evidence that the ambassador has lied. Although it is evident that the human are in danger, Dzhaz tried to persuade the Institute to leave the human undefended, vulnerable to destruction. I am here only through a compromise between Dzhaz and the Institute, and it

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was Dzhaz who suggested an enlightener be employed here.

I put on my suit and depart. I must find a way to finish the enlightenment/training of my students. The ambassador claims the human leaders have prohibited this, but this may not be true.

The students are in the simulators. The building is under armed guard. The guard challenges me, but steps aside when I state I am here to aid in training. He does not recognize me; all he sees is the environment suit. The enhancer demands that I identify myself, lest I enter under false pretenses, but before I can comply several of my students appear and call me by my title. There is a brief discussion—the human leaders have, in truth, forbidden contact with me—then the guard departs to inform his superiors of this discipline breach.

"There has been a political maneuver," a student tells me. "One division of our leaders fears your ideas could destroy our culture. They are in the minority, but the majority is unwilling to fight over the point, which is sensitive."

"The ambassador has expressed similar fears," I say. "I do not deny that my goal is to change your culture."

"That is understood," Barrelmaker says. "It is not understood that you can do it."

"The technique is evident," another tells her. "Train us in his ideals, put us in a position of leadership, then allow others to follow our example through hero-worship."

"Correct, succinct," I state.

"Also forbidden." The guard has returned, along with the leader who addressed the students before. He places himself between me and the other human. "The ambassador has warned me against you. You are not to further contaminate us."

"There is no contamination," a student named Clothworker tells him. "We can judge the value of almsot concepts for ourselves."

The leader faces him. "The danger of these concepts is not necessarily apparent."

"How can I judge the danger if I do not study these concepts? Many of them appear identical to ours. Where is the danger in recognizing shared concepts, values?"

I judge the leader to be exasperated. "The ambassador has warned us."

"When did we begin to take the ambassador's word as truth?" Clothworker asks. "The ambassador is not known for honesty—"

"You are a stupid darkskin," the leader announces. This statement creates upset among all. The students make movements toward the leader; the guard makes a gesture with his weapon and they back away. There are confused statements which go untranslated. Threats are exchanged. The leader will imprison the students if they continue to misbehave. The students will not enter combat if I am not allowed to instruct.

It takes time for me to make my own statement. "Students will of course do duty, engage attackers as required," I say. I ignore their inexplicable dismay, address the leader. "To forbid me to instruct them is to minimize your world's chances of survival. Your approach is non-optimal."

"To allow your return is to destroy us in a slower fashion."

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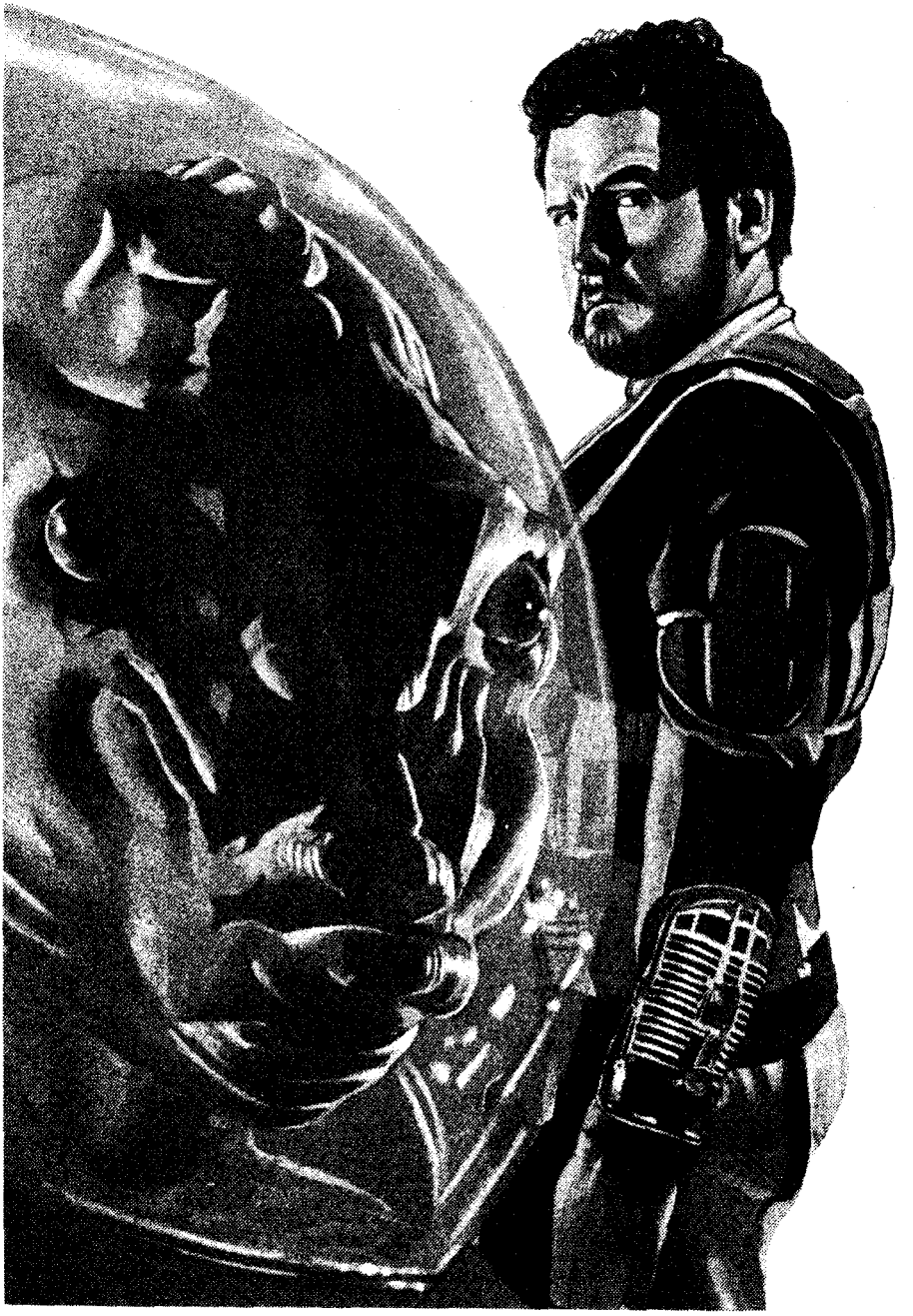

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There is anger in the leader's voice, but the decrease in volume suggests he grows calmer. I tell him, "If I am a threat, surely I have already done my damage. You have nothing further to lose, perhaps much to gain, by allowing me to resume my work." I do not mention the ambassador's intrigues; I judge this would be ignored as a ploy of my own.

His facial muscles contort, a communication mode with which I am not overly familiar. After a brief moment he orders the guard to come with him. The reaction of my students suggests that I may resume my work.

For the next week I drill them to their limits. Their skills improve, yet I note changes in their attitude. They are unhappy. I feel a special affinity for Barrelmaker, hence I decide to discuss this problem with her. We speak in private in my quarters.

"It stems from the confrontation," she says.

"I noted that all were displeased when I said they would fight no matter what."

"Our threat to refuse service was a bargaining tactic," Barrelmaker says. "Your statement negated it."

"I admit I do not understand human bargaining."

"It is not the true problem." Her mode suggests great reluctance to speak. "The leader used an offensive word. It caused him to be replaced, as is proper, yet it left us with ill emotions."

This allows me to raise a baffling point. "I noted that he labeled Clothworker a darkskin."

"That was the offensive word."

"The meaning eludes me." Yet a possible meaning now occurs to me. In many ways, some irrational, the human feel inferior to almsot. I broach this idea without proper meditation. "Has the ambassador made unfavorable comment upon human appearance?"

"No. Clothworker belongs to a genetic grouping marked by dark skin. Is this not obvious?"

"No. Almsot eyes see in your ultraviolet light. Human skin absorbs these wavelengths almost perfectly. Thus all human appear to have dark skin."

"I find this remarkable." She meditates briefly. "We would be better off if our eyes saw as do yours."

"I fail to understand."

Barrelmaker states that, to their eyes, humans have different skin colors, a factor which has led to great trouble. Her mode is confused; she wishes to make the situation clear, yet it must shame her to explain this matter to a non-human. The fact that she does not fully understand the matter makes it even more difficult for her.

She departs, and I wonder at this event. Human, like almsot, are driven by emotion. Did the leader give an inexcusable insult because of his emotions? Or was it a calculated act? If so, to what end? All that is certain is that this issue of color has unsettled my students, driving a wedge between them and their leaders—and, perhaps, the rest of the human.

The days pass and the raider approaches this planet. When it crosses the orbit of the local moon I signal it, implore the crew to forego their mission, finally inform them of the size, power of our forces. Nothing impresses

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them; they advise me to leave or die, then break contact.

With regret I inform my students that negotiations have failed. This does not upset them; if anything, they are displeased that I kept nothing secret from the raiders, even though secrecy could give us no advantage.

At least they do not appear eager to kill as they enter their craft. They launch at maximum acceleration, in seconds vanishing into the clouds overhead. The thunder of their drives fades quickly, and I go to the embassy to watch the course of the battle.

Events are predetermined. The raider moves ponderously at planetary speeds, on a course which will put it in polar orbit around the planet. Our craft follow arcs which will intercept the attacker, bringing them to rendezvous before it can bombard the planet. I watch glowing points in a computer display, but there are no messages from our craft; thrusters and drives create too much distortion.

Moments before intercept, a surprise: the raider launches a spread of missiles. In seconds our force splits, three of the craft accelerating madly to chase down the drones, many of which are targeted on Capital City and ourselves. As the craft pass the raider one is struck by an anti-meteor ray. Its drive fails and our sensors report it is inert, the pilot dead. I mourn my student even while the remaining three craft set upon the raider.

The ambassador joins me to watch the elegant maneuvers. "They call this tactic the ghost dance," it says. "Do you know the significance, Enlightener?"

"I profess my ignorance. And you, Excellency?"

Dzhaz does not feel my barb. "On this continent once lived a sub-race with red skins, named Indian. They were hunted almost to extinction by the sub-race with white skins. The Indian culture was shattered. Toward the end its members, in desperation, turned to magic. They adapted elements of the white religion into their own belief-system, producing a new cult which said the white human would soon vanish and deceased red human would return to life."

"Leaving possession of this world to the red human." I am helpless to influence the battle, and hence welcome even this distraction. In the display, two craft pursue the drones, slowly eradicating them. It is probable that they will finish this task before the missiles can reach us, but their trajectories will keep them away from the raider for a long time. Their role in the battle is effectively over, and our force proportionately reduced.

The other three craft weave toward the raider as they prepare to disable it. The raider fires upon them, to no avail yet.

"As you say, Enlightener. The red human did not understand the white cult. They only thought that by taking parts of it they could use its magic power to eliminate the whites, and thereby save themselves. A central facet of this cult was a ritual called the ghost dance."

"Hence the name of the tactic, I conjecture."

"Unlike your students, you miss the point. By using this name, the students state that we are destroying their culture. Our most pernicious act is to introduce our alien values, as the white human did

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to the red." It pauses for effect. "The white human used their own enlighteners to this end, as a cultural weapon, just as the Institute sought to use you. Tell me, Enlightener, does your conscience permit you to save our society at the cost of theirs?"

I can make no reply, as it knows. The purpose of enlightenment and social mathematics are to aid civilization, not crush it. The thought that I may have done harm all but paralyzes my mind.

The computer announces that our craft are within suppresser range of the raider. The engagement is sharp, quick. One of our craft is disabled by the enemy suppresser, but the pilot lives. Before the raider can engage the other craft they contact it, suppress its power systems, latch onto its hull, take it in tow.

"Excellent," the ambassador states. "They will now give the captives to the human government for trial and disposal."

I realize this means execution. "When I came here, Excellency, it was with the clear understanding that captured raiders would be disarmed, released."

"An outdated tradition." Its mode is regretful. "When civilization stood on three healthy legs, that was safe, sensible. Dangerous ones, once identified as such, could be monitored, prevented from making more trouble. Now to release such is to release more trouble."

"I will not act as a barbarian." I do not need the enhancer to prompt my reply. "And what of your acts? By giving the raiders to the human, do you plan to insure their deaths?"

"That is out of my control, Enlightener, and yours." With a courtly gesture it departs.

I find myself without time or data for proper meditation. Soon the surviving craft return. Two craft have the raider in their grapples, and they bring it to ground at our crude spaceport. Two more craft each carry another craft in their grapples: one damaged craft apiece, one of which bears a dead pilot.

Both human and almsot gather around the raider. As the pilots debark they are greeted as befits heroes, an event tempered by the removal of the dead pilot's body from her craft.

The ambassador orders the raiders to exit their craft. As they do so, several human point weapons at them—a futile gesture, as bullets cannot penetrate their suits. Despite this, the raiders accept it as a ritual gesture of conquest. Not anticipating this turn of events, they brought no personal weapons—does one ever start a war with the expectation of defeat? Thus they are helpless . . . yet as dangerous as ever.

"They are your prisoners," the ambassador tells the elected human leader. "I concede your full authority over them."

Barrelmaker has joined us. "What will you do with them?" she asks.

"That has already been decided. Execute them."

Conscience demands I speak, prohibit this, save the lives of the raiders. Yet Barrelmaker speaks first: "They are prisoners of war. Execution violates all tradition, justice."

"The public demands execution," the leader states.

"Has a vote decided this? That is how the public makes demands."

"We have no facilities for holding almsot captives," he protests.

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"Nor can we spare the room," the ambassador says suddenly.

Barrelmaker faces Dzhaz as though she can see through its suit. "Explain your eagerness to see almsot executed by human."

The ambassador denies such eagerness, but the leader speaks over its words. "Expand upon that statement," he tells Barrelmaker.

"It is evident that the ambassador wishes us to kill the raiders. Yet everything the enlightener has said proves that civilized almsot would abhor such an act. For some reason Dzhaz wishes to make human repulsive to civilized almsot."

"Statement of fact," I say, feeling a small enlightenment. "The ambassador has shown me carefully selected facets of human culture. The effect was to make human appear barbaric, evil."

"I express my denial," the ambassador says, in a mode of outrage. "I have tried to protect human culture from contamination, from damage—"

"Explain how an act of mercy will damage us," Barrelmaker says.

The ambassador speaks over our private link. "We cannot permit the human to join civilization. We must maintain them as they are." Its mode is that of one desperate for aid.

In disgust, I switch off the link. "We will discuss this openly," I state through the translator. "The human must engage in any decision which affects them."

"We do not yet know which factor allows them to rise from their collapse," Dzhaz states. "Thus we cannot make changes safely. We risk the collapse of both almsot civilization and human culture."

The human leader wavers, but Barrelmaker spots a discrepancy. "Why do you call the one a civilization and the other a culture?"

"It is merely a technical difference, an overprecision—"

"You speak falsely," I state. "My scientific training is not profound, but I comprehend the terms. You do not feel the human are civilized."

Dzhaz addresses the leader. "You are not as we are. Should contact grow between you and us, you will become as us, lose those things which make you distinctly human. You will be nothing, civilized beings without a culture. You have seen this in your own history—less-developed societies overwhelmed, crushed by outsiders." He speaks to Barrelmaker. "Explain the significance of the ghost dance."

She faces it. "The untranslatable tribe adapted our religion to its needs. Our beliefs—savior, paradise, certain doctrines—were mixed with Indian rituals. This was done in reaction to white attempts to crush them—"

"It is proof of crushing," the ambassador states. This interruption surprises me. Rudeness is not an almsot trait.

"It is the opposite of proof," Barrelmaker says. "One tenet of the ghost dance religion was that the deity would show favor to the Indians and enmity to the whites—hardly a belief conquering whites would force on Indians. This religion spread rapidly among the Indians, was accepted as an admittedly desperate proof of their own worth. This shows the resilience of Indian culture, does it not?"

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Dzhaz remains adamant. "Despite this, the Indians were crushed."

"Only through prolonged and massive efforts by the white culture. Will you make a similar effort against us?" When Dzhaz does not respond, Barrelmaker faces the elected leader. "Do we fear change?"

"Perhaps." I think his pause is meditative. "Yet we cannot let fear alone make our decisions."

I speak. "Contrary to the ambassador's claim, we can accommodate prisoners, return them to their homeworld."

"Then do so," the leader says. He and Barrelmaker depart. I watch them cross the spaceport field, to speak with the guards. I feel triumph, accomplishment. The defeat of the raiders, coupled with their magnanimous treatment, will win the attention and admiration of many almsot. This may mark the turning point of our collapse.

Dzhaz assumes a distraught mode. "This will start dissonances in human culture, contradictions which will shatter them."

I face the ambassador. "You are undone," I say. "Barrelmaker understands your strategems, as do I."

"If you understand, then all is not yet lost. We cannot allow full contact between human and almsot. The danger is all but incalculable."

"I no longer believe you care for their well-being," I state.

"I speak of ours. To stop our collapse, we must imitate them. Is that not clear?"

"Abundantly." I cannot keep annoyance from my mode. "We must imitate certain aspects of their culture, avoid certain others. One advantage of enlightenment is that it negates the aspects we would avoid—"

"And those we must imitate."

"That is false." I need no calculations to prove this. "We plan to regain our civilized status by resonating with the human. This would be a futile plan if the human could not attain civilization, for where is the good in imitating savages? And we consider enlightenment to be harmonious with civilization—"

"Not in mathematical terms."

"Explain these terms to me."

"They are too subtle for understanding by one without full expertise."

I contemplate the sky. It contains ozone, which absorbs much light, making it dark, gloomy. I share that gloom; the ambassador covers each of its lies with another lie. "Excellency," I state, "One with full expertise can explain terms, give understanding. I am neither impatient nor stupid."

"Neither are you insightful. There are multiple-order harmonics, polyphase resonances which are hard to identify."

"You dissemble," I say. "You have labored to sabotage your own work. When you requested the services of an enlightener, you knew the human would see my activities as an assault on their culture. Were you the one who suggested that the ex-leader insult Clothworker? Were you the one who suggested the execution of the raiders?"

"My comments were misconstrued by the human, a result of their barbarity—"

"And you lacked the wisdom, insight to take this barbarity into account? Nonsense. Only your motive eludes me,

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Excellency. Why do you work to make our collapse inevitable?"

Dzhaz says nothing; I answer for it. "Pride. It humiliates you, does it not, to think that we need the human to save us from collapse? To see that they help us as much as we help them?"

"It is better that we collapse than share space with the human." Its mode convinces me that I have found the answer. To seek aid from the human is proof of how far we almsot have fallen. Pride has twisted the ambassador; it has lost faith in its work, and it prefers destruction to seeming humiliation. This saddens me; not even Dzhaz is immune to the rot which destroys our civilization.

The ambassador continues to speak, an almost mindless cataloguing of its fears. "They contaminate us. Resonance with the human will destroy us."

"How so? Our civilization is already in collapse. Can they make things worse?"

"They are savages, instinctive killers," Dzhaz says. "They cannot become civilized."

"Yet Barrelmaker persuaded her leader to make a civilized decision. This demonstrates the falsehood of your claims—"

Madness! The ambassador leaps upon me and I fall to the ground, my arms flailing as I try to push it away. Dzhaz clutches me and slams me against the pavement, twice, and I feel the shock of impact through suit and exoskeleton. I wrap arms and legs around the ambassador, making it impossible for it to throw me again. Dzhaz rolls atop me, and one hand attempts to smash my helmet.

"You must stop," I state. Pain distorts my mode. "If you breach my suit you may contaminate the biosphere—"

The hand claws at my faceplate. The enhancer makes fight impossible. I shove the ambassador aside and attempt to flee, but one leg is damaged. I manage two steps toward the embassy enclosure before I collapse. I see human and almsot run toward us, but the distance is great.

At once the ambassador is atop me, taking my helmet in all three hands. My head jars as Dzhaz smashes the helmet against the pavement, and a visor begins to mar and deform. "Stop," I state. The enhancer leaves me but one option. "If you must kill me, do it in the embassy."

"You must die now," it tells me.

"I will let you kill me in the embassy, only do not risk contaminating this world!"

"I lack concern for the human. They are inferior, beasts, unworthy of consideration—"

Bliss, bliss! Ecstasy roars through me. I conjugate with a superlative almsot, I deposit my spores in ground of unequaled safety and fertility, I estivate in ultimate chill and darkness. Someone has shot me with a neuro-inductor, an action which stimulates my pleasure centers. Sensations of matchless joy incapacitate me and I know nothing further.

I awaken in the embassy, where a medibot tends my injuries. It assures me that my suit did not lose integrity—self-evident, as the Dirt(?) atmosphere is toxic to almsot.

I feel a sense of well-being. The ambassador has destroyed itself, I reason.

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Its dislike of the human will be seen as the product of a diseased mind. Barrelmaker and her kind will find their future in civilization and the galaxy, which I judge will please them. They will be enlightened, which pleases me.

The ambassador enters my chamber. "I have resigned my position," it states, in a neutral mode. "I would have you assume my ambassadorial duties."

"An unusual proposition," I say. This intrigues me. It would place me in a position to further my work and correct the damage done by the ambassador. "Why do you do this?"

"I have no alternative, Enlightener. My sanity is damaged. After attacking you, and meddling in human politics, even I cannot dispute this."

"Indeed," I state. My mode is distraught, I know, although I try to make it sympathetic. To realize that one has become insane—surely that is a horrible experience. I marvel at the obvious calm, strength, with which Dzhaz bears this knowledge. "How will you endure this?"

"I will seek treatment."

"You will seek long," I tell him. "There are few almsot with expertise in such matters."

"I will seek as long as required." His mode is resolute, yet tinged with —triumph? Yes, undeniably. Perhaps this is a product of his insanity. "I will visit every world, if I must. I will visit charlatans, if all else fails. I will rid myself of the human-inflicted madness. But will you assume my duties?"

"I lack qualifications, experience."

"As did I. However, you have an empathy with the human, and they respect you. These are considerable assets. More to the point, there is no other candidate. Will you accept?"

The enhancer answers for me. "Yes. The human require this."

Dzhaz leaves and I feel quite pleased with myself. The embassy staff adapts to the change, addressing me as "Excellency" and presenting me with the routines of my new position. A discussion with human leaders. Enlargements to the repose-chamber, so that the raiders may estivate until a ship can come for them. Dzhaz's request for transport to another world.

I ponder this, and feel fright. Dzhaz is not insane. The ex-ambassador has strategems within strategems, and I have fallen victim to one. It now has the power to drive a wedge between human and almsot, to allow our collapse to proceed, and I am powerless to stop it. Unless—

I summon Dzhaz to my office. "I express curiosity. What drove you insane?"

"I cannot know, Excellency. I only note that my behavior has been unacceptable. I no longer behave as should a decent individual."

"Statement of fact. Do you blame the human?"

"I have spent much time here. I have had much contact with them."

"Indeed. Those from whom you seek help will note this. They will see that you echo the lowest qualities of the human. Through you, they will come to see the human as monsters, creatures lurking in darkness."

"I seek only treatment, cure—"

"A cure you will never find. Your quest is an excuse to travel, to spread your views of the human and thus poi-

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son our relationship with them. Reports of your condition will spread among doctors, scholars, decision-makers. Resonance with the human will be dampened and we will collapse."

"Surely you exaggerate," Dzhaz states.

"As you claim to be insane, you cannot properly judge this," I say. "There will be none to speak in effective defense of the human. I would do so, but my new duties make travel impossible for me. And who would wish to replace me, in a job which has driven you insane? Thus I am trapped on this world."

We contemplate one another. Both of us know that Dzhaz is sane, that I have described its plans in full, even to my entrapment. This does not discomfit Dzhaz; I believe a human would describe it as smug. "I have requested transport away from this planet. I understand the Institute ship leaves soon."

"Statement of fact." I pick up its request form. The grooves and dents in the cylinder are quite proper and orderly. "Yet how can I permit this? My conscience troubles me. I do not believe you are insane."

Dzhaz taunts me. "Your conscience will not let you hinder me. It is programmed with absolute standards. I have acted in violation of them, and thus it must consider me insane. Thus you cannot deny me the right to seek help. The alternative is to let me suffer from my violent impulses, which is unconscionable."

This is quite true. I must allow it to seek help. I cannot prove that it is feigning madness, and in fact I see its behavior as quite mad.

And then my conscience resolves itself. "Indeed, you are violent and unpredictable," I say. "To put you on a ship would endanger the crew. I must deny you permission to travel." And I place the request cylinder in the eliminator.

Dzhaz's membranes pulse with shock. "You know I need help! You cannot deny me the right to pursue it!"

"Nor do I. You may seek help here, on this planet. Barrelmaker has shown insight, facility—"

Dzhaz suggests I contort and conjugate myself, after which it leaves my presence. I am certain it will continue its efforts to destroy what we do here.

Yet I will be here to counter Dzhaz's moves, to protect both human and almsot. We dance a ghost dance to restore civilization, and I have found my role in this dance of resonances. ■

●The birth of an idea is the happy moment in which everything appears possible and reality has not yet entered into the problem.

Rudolph Diesel

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the reference library

By Tom Easton

Waiting for the Galactic Bus, Parke Godwin, Doubleday/Foundation, $17.95, 229 pp.
Prelude to Foundation, Isaac Asimov, Doubleday/Foundation, $18.95, xii + 403 pp.
Beyond Gravity, Justin Leiber, TOR, $?, 276 pp.
Tool of the Trade, Joe Haldeman, Avon, $3.95, 248 pp.
Four Hundred Billion Stars, Paul J. McAuley, Ballantine/Del Rey, $3.50, 282 pp.
Land's End, Frederik Pohl and Jack Williamson, TOR, $18.95, 384 pp.
The Brave Little Toaster Goes to Mars, Thomas M. Disch, Doubleday, $11.95, 72 pp.
Retread Shop, T. Jackson King, Questar/Popular Library, $3.50, 276 pp.

The cover of Parke Godwin's latest, **Waiting for the Galactic Bus,** is misleading. It shows a bemused-looking chimp sitting beside a sign bearing an upward-pointing arrow and the superscribed words "Galactic Bus." There is also a hand jutting out of the sky and pointing one finger at said chimp. To my mind, this says that we human beings, transformed from apes at the hand of some superior being, perhaps alien, perhaps divine, are sitting on the curb watching all the cars go by and just waiting for our chance to leap to the stars.

Maybe we are, but that's not Godwin's story. According to him, once upon a time, just a few million years ago, a pack of students wrapped up their work at Cosmic U. and took off on a helluva toot. The party eventually ran out of steam on Earth, and most of the gang went home from there. But they left two wild brothers passed out on the lawn. They would, they told themselves, come back for them soon. But not until they'd had a chance to sober up and see the error of their drunken ways. Unfortunately, the returned stu-

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dents were quickly and thoroughly preoccupied by life, and time passed. . . .

The brothers, Coyul and Barion, soon grew tired of waiting for their Galactic Bus to return. They got bored. They looked around, saw an interesting primate, and, by giving its intelligence just a little nudge, did the absolutely forbidden. And the Bus still didn't come. So they nudged again, and again. They found that the nudged primates released a sort of essence of themselves at death, and they set up suitable environments for these incorporeal versions of their pets. One environment, run by Barion, now corresponds to heaven. Coyul's is hell, but a hell populated by fun-lovers as much as by the bad.

Hey, it beats twiddling your thumbs through the eons. Unfortunately, the game does tend to grow on you. You begin to care about those pesky primates. And when you spot a frustrated religious fascist with no hope of power about to marry a bright young thing with no hope of ever realizing her intelligence, you realize that there's an odds-on-chance that their kid will be a frustrated, bright, religious fascist who will quite literally set the world on fire.

So. What do you do? Godwin says that God and the devil put their heads together, recruit a few departed actors, musicians, and assorted others, yank young Roy Stride and Charity Stovall bodily into the afterlife, and give them everything they want. For Roy, that means screaming mobs, bloodied corpses, adulation, power. For Charity, it's luxurious self-indulgence, but there's Roy constantly on TV, grinning as he holds up dead babies, and she realizes eventually— she's bright, remember —what a scumbag he is. No, she won't marry him. No, there won't be some Stride-Stovall hybrid to destroy the species. Yes, she wants out of there, preferably with Woody Barnes, a trumpet player who had long hung around the Roy-Charity duo just to be near her.

Isn't it marvelous to see young people come to their senses?

Unfortunately, the deal is almost queered when Barion's and Coyul's old classmates finally show up to fetch them home. They are shocked by what the boys have done on Earth—unauthorized evolutionary boosting is a heinous crime among their people—and one of them will certainly have some music to face. But yes, it's a pretty mess these humans are in, and one of the boys really had better stay behind to keep an eye on things.

Any bets on whether Godwin thinks we are now in the hands of God or the devil? Read the book to settle them. You'll have fun.

When Isaac Asimov wrote his first *Foundation* stories, the man to whom he credited the development of psychohistory was clearly a genius. But he was an old man, and the author was not. And this disparity in ages may be an important clue to the way authors think of their characters. Consider **Prelude to Foundation:** Asimov, now much older himself, feels like a genius. He *is* a genius. He *was* a genius when, as a mere stripling, he invented the aged Seldon. But now, looking back at his own youth, he perhaps does not see his own early genius, but rather a callow, dense, unaware, general chuckleheadedness. And when he writes, as now, of Seldon's youth and the first glimmerings of psychohistory, he presents Seldon as just such a chucklehead.

Am I giving Asimov too much credit for humility? He himself might say I am, but that is really beside the point, which is *Prelude*. And the book

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is . . . let's say it's for fans. It presents Seldon, with his first suspicion that psychohistory might be possible, on Trantor for an academic conference. The Emperor summons him for an audience, at the behest of his advisor, the highly persuasive Demerzel. Later, he meets Humin, equally persuasive, who helps him escape muggers and steers him to hideaway after hideaway on Trantor, thus giving the reader a tour of a complex world. Unfortunately, the reader recalls from Asimov's earlier work both that R. Daneel Olivaw became able to influence human minds quite persuasively, and that this distinguished robot long ago decided to push for something very much like psychohistory. The reader therefore sees the gimmick coming long before Asimov makes his clues blatant.

The book is thus one more tile in the Asimovian mosaic, but it is to my mind horribly flawed by its end.

**** SPOILER WARNING ****

Throughout the story, Seldon is accompanied by the historian Dors, whom Humin "asked" to help. Seldon is drawn to this woman, and there is thus a certain amount of romantic tension that never quite comes to anything. But then Asimov implies quite plainly that Dors is a robot like Olivaw. And *then* he snaps that romantic tension. In the process he reduces Seldon to a plastic Ken playing with a compliant, inflatable Barbie doll and renders pathetic the colossus of his future history. Presumably the next volume will tell us that Dors is really human, or that the Turing test should apply to anatomy as well as psychology. And perhaps it should, but the way the Master springs it on us here does come as a shock.

With *Beyond Rejection*, Justin Leiber introduced a hero, male, awaking in the body of a woman possessed of a tail. He, Ismael, drowned beneath the sea. She, Sally, perished in space, with her body, mind-wiped, in suspended animation, set on a return trajectory to Earth. Because his mind had been taped not long before his death, he could be played into Sally's empty body. *Beyond Humanity* added new wrinkles to body exchange, anti-chimp, anti-computer Man-Firsters, and a message to the stars; its weaknesses were those common to middle volumes of trilogies, or to the central portions of single novels. Now, in **Beyond Gravity,** Leiber brings it all together as the nameless hero awakens among aliens that look much like attenuated chimps. He has no idea of who he is or how he got there. The aliens seem benign enough, but the gravity is strangely light and he soon realizes that he is "beyond gravity," in space. But "beyond gravity" is a pun as well, for Leiber's story has its share of levity.

In due time the hero learns that his body had been taken from the sea after it had drowned. Later, the aliens encountered a wrecked spacecraft just after the pilot had activated suspended animation and put ship and semi-corpse on route to Earth. They recorded the pilot's mind before it faded entirely, lifted a few artifacts, and left the pilot's body on its route. Now, the pilot's mind is in the drowner's body, the aliens have been invited to Earth, and the inviters are due to arrive shortly. Our hero will meet them, and the stage is set for an identity crisis of cosmic proportions. The ending truly brings together every loose end in three volumes and makes the trilogy a single, unified tale with a single, unified theme of tolerance for difference, even extreme difference.

Yet problems remain—first, the three volumes are each so short that the tale would not have made a single volume of unmanageable length. Second, Lei-

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ber or his editors nod at times, as when he tells us that the date is 2113 and the aliens have been watching Earth for 260 years, ever since 1950. Another example pops up when Leiber says that a newly discovered human ancestor was named "prosimian"; that might fit, yes, but the term already applies to an entire suborder of primates, that containing the lemurs and lorises.

Joe Haldeman's latest, **Tool of the Trade,** suffers from a problem common to that subgenre of SF that pretends to tell us how to save the world from its folly. The novel is well thought out (within its constraints). The main character, Nick Foley—a child of World War II's seige-torn, starvation-wracked Leningrad, trained in Americanism, sent to the U.S. as a mole, a secret agent awaiting activation in some time of need, now hooked on the free American way of life though still loyal to Mother Russia—is very well realized and the settings—Cambridge, Florida, Leningrad—ring true as they can only in the hands of one who has been there. Minor flaws include the KGB villain, "the Scalpel," who kidnaps Nick's wife and threatens her with lit cigarettes and razor blades; he is just too, too clichéed. Another is the rifle bullet that hits Nick in the chest and is then never mentioned again (shouldn't he at least say "Ouch!"?). Still another is the head cold that renders the villain conveniently deaf (as if bone conduction wouldn't work quite well enough in the context).

You can tell already, can't you? Even as I kvetch, you say to yourself, "Hey! This one sounds exciting! It must move right along, and it obviously has all the intrigue and mayhem anyone could possibly want." And you're quite right. There is a place for cliché villains, and when the story is moving fast enough, who's counting the bullet wounds? It's a good read, yes it is.

And I can't even say that the real problem—see my lead sentence above—gets much in the way. That problem is that if we, even for a moment, suspend our disbelief we promptly stop believing. We can't help thinking: If it's that easy to save the world, then how come we're still so miserable? Nick, quite by accident, discovers that a certain ultrasonic frequency has the effect of making people biddable. He has a tone generator built into his watch; thereafter he uses it to tell muggers to go shoot themselves, and they do. Eventually, both the KGB and the CIA catch on that he has something special, and the hunt is on. Foley must stay free until he can rescue his wife. Then he must get into position and tell the world's leaders exactly how to end the arms race. Finally, he must somehow keep his secret from falling into the hands of tyrants.

If at the end we decide it's all a crock, we can still say, "If only . . . " It's a good read, an enjoyable yarn, and told with all of Haldeman's considerable skill, but it *is* pure wish fulfillment.

I didn't know who Arther Treacher was, but if I recall correctly, once upon a time, several years ago, there was a chain of roadside restaurants that bore his name. Now here's a novel in which an automated food dispenser is called a "treacher." I like that. It puzzled me at first, but then the word drew forth the memories and I began to sense the past implicit in the world of the story, a past in which, perhaps, an Arthur Treacher Food Service, Inc., put an Arthur Treacher Food Dispenser on the market, and it became so popular that, once the competition hopped on the bandwagon,

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people gave food dispensers of all kinds the name (*vide* Kleenex, Xerox, Kodak, Frigidaire).

The author responsible is Paul J. McAuley, a cell biologist at Oxford University in England. Praise him for his capturing of reality in a word. Few writers manage it so deftly.

The novel is **Four Hundred Billion Stars,** and it is not always so praiseworthy. McAuley is fond of ornithopters, long since proven impractical, and he strains for his images, as when he has the scenery "trawl past" a moving observer (the phrase suggests to me the precise opposite of his intent: a fishing boat heaving in ocean swells while it drags a net—the trawl—across the dark and murky seabottom behind it). Yet the story is more interesting than such cavils might suggest. Humanity, spreading among the stars, has encountered a system whose asteroids are populated by fierce aliens who destroy themselves when defeat or capture seems imminent. Nothing is known about them. But then a nearby system shows signs of an ancient civilization that may be related. A world has been moved close to the limited warmth of a red dwarf sun; wildlife drawn from an ancient Earth (and elsewhere) wanders the globe; ancient, empty cities occupy the centers of craters; natives who may or may not be sentient herd giant caterpillars on the plains. Are the natives related to the foe, perhaps as their degenerate descendants? Are they caretakers, who will awaken another enemy nest if humans rattle their cage too strongly? Are they . . . ?

The navy drafts telepath Dorthy Yoshida, dragging her from her astronomical research in the Oort Cloud, to probe the cities and the natives for the answer. No experienced reader will be very surprised to learn that she finds one, though she must first be marooned in the wilderness, endure a long trek back to base, find and lose a lover, watch the natives change their ways in a frightening fashion, and then shift the story's focus to a very different crater, one that contains an Arecibo-type radio telescope. Once there, she learns—

I should not say. McAuley, as a biologist, has a somewhat different view of utopia than many. He seems to say here that the goal of life might well be contentment, stability, even stasis, and that it might be achieved by a species that lives, most of the time, quite a vegetative existence. When danger threatens, however, there emerges from the species' genes a different type of being—smarter, fast-learning, problem-solving, and able to counter the threat so that the species can return to its slumber. Such a species might cycle through its repertoire thousands of times before a crisis arises that takes so long to solve that the species develops science, space travel, and ways of passing knowledge across the long, placid interregna between the times of sentience. Then, too, it might fragment, as portions of the species find ways to ensure continual crisis and prolong their sentiency and their technological development. Other portions of that species might then have to post alarms to activate their own sentience if and when their more predatory cousins discover them.

Here, of course, is where humanity, McAuley, and you, Dear Reader, come in.

Land's End comes from two of SF's most luminous surviving luminaries: Frederik Pohl and Jack Williamson. But it's damned hard to swallow.

The problem lies in the social background. According to Pohl and Williamson, sometime in the not-too-distant

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future, one man will unify the entire western hemisphere under his personal dictatorial hand, and he will pass it to his descendants as PanMack, a loose confederation of personal fiefdoms, each ruled by a McKen. These McKens are greedy, tantrum-throwing, domineering, self-indulgent, short-sighted, tyrannical—everything that the newspapers have ever laid to the feet of a Marcos or a Somoza or a . . . I am sure that even though such tyrants may indeed be pigs of the first mud, and that they have done the things of which journalists accuse them, they cannot possibly be that nasty that constantly. The villains of *Land's End* are caricatures straight from the comic strips, and their presence in the story makes it a very difficult story not to bounce off the opposite wall.

It's a shame. It is. With a little more verisimilitudinous complexity of villainy, it could have been a crackerjack. Consider: Civilization exists on land, as tyranny, and in the seas, as the free Eighteen Cities (founded by Eustace McKen, the good brother of the SOB who founded the lubbers' dictatorship). Now comes a comet that will strike the Earth, but the forces of the bad McKens nuke it into fragments. They are busily congratulating themselves on their virtue and heroism when the fragments begin to arrive in a spectacular display of fireworks. And then the ozone layer disappears. And then cometary CO_2 runs the Greenhouse Effect sky high. And then the vegetation dies. And the animals. And the land-dwelling humans, unless they have an underground redoubt or an escape to an orbital habitat (somehow undamaged by the shower of cometary fragments). Only those of the Eighteen Cities have hope, though they must fight off a McKen attack or two and Graciela Navarre must lose her fiancé, Ron Tregarth, when he, a submarine captain on a trading voyage to the land when the trouble erupts, disappears, a prisoner of and slave laborer for the McKens.

Now awakens the Eternal, an alien being or construct that, shipwrecked, has slumbered in the ooze of the ocean depths for many millions of years (never mind that plate tectonics would have cycled it into the mantle long ago). It takes over squids, alligators, condors, people, promising them eternal life and eternal palling around with aliens galore within its eternal mind. All it asks is that they serve it as hands and bodies to build a starship that can escape Earth and let it continue on its life-collecting journey through eternity.

Does anyone survive to inherit the Earth, to rebuild a renewed civilization? Of course they do, as the structure of modern SF insists. Who survives? Who else but the star-crossed lovers, as the structure of modern romance insists and the cover blurb reveals. Who will read this turkey? Not as many as the publishers would like. Even luminaries flicker.

Some time ago, Thomas M. Disch wrote a charming children's story in that antique vein in which inanimate objects speak with each other, dance on the playroom floor, and yearn helplessly for the unattainable. *The Brave Little Toaster* concerned a neglected appliance which turned self-assertive and undertook a journey of return from exile to usefulness. Now **The Brave Little Toaster Goes to Mars,** for its friend, the radio, has picked up a weak message from the Red Planet revealing that a horde of runaway appliances are planning to invade Earth, slaughter the humans, and liberate their enslaved cousins. Fortunately, the toaster, the radio, the vacuum cleaner, the electric blanket, the ceiling

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fan, the microwave oven, and the calculator are able to recharge the defunct batteries of a hearing aid once invented and used by no less than Albert Einstein. The hearing aid then reveals Einstein's never-released Grand Unified Theory and teaches the others how to degravitize themselves and fuel the journey to Mars on one boxed macaroni-and-cheese dinner. And off they go.

Not surprisingly, the brave little toaster and its friends force an election. The Supreme Commander of the invaders, a refrigerator the size of the Great Pyramid at Giza, campaigns on a platform of Conquest! and Liberation! The toaster promises New! Directions! and the Exploration! of the Cosmos!

Do I need to say who wins? Or that a sort of Tinkerbelle, complete with a sprinkling of fairy dust, helps our friends make it home? It's obviously as charming as its predecessor, and as worthy of your, and your kids', enjoyment. My own ten-year-old daughter is reading it now, and making some very happy noises.

About a year ago, I acquired a new correspondent in writer T. (for Tom) Jackson King. He has finally sent me proofs of his novel, **Retread Shop,** with the warning that I should "bear in mind that my writing has improved from this novel—I've written three other novels since it."

I should hope his writing has improved. (Sorry, Tom.) *Retread Shop* offers us the proposition that every 100 million years, the galaxy cleanses itself of civilizations (the "three-kiloparsec" arm of the galaxy falls into the central black hole, releasing a blast of deadly radiation, and then the Winnowers run around cleaning up). Therefore, there has been a long series of Florescences, or flowerings, and we have been in the Forty-Seventh for the last five million years. In that time, the first civilization to emerge, the Kokseen, built a trading station for the exchange of food, fuel, information, and artifacts of past Florescences, other species added onto it, and now we have the Retread Shop. Alone in its vastness is the human youth, Billy McGuire. Orphaned by the plots of alien villains, he survives as a thief until one of his intended victims, a predatory plant, in effect adopts him and sets him on the path to becoming a Merchant. Of course, being human, Billy finds that path remarkably easy and fast, despite the efforts of the nasties, and he makes Merchant rank just in time to welcome a batch of fellow humans to the Shop.

Shop has its points. King handles some implications of immense time scales well, and the action moves right along. But scientific plausibility does not seem his forte. His timing mechanism for Florescences is ridiculous on the face of it, many of his aliens are impossible—for instance, no living thing could subsist solely on the emanations of dying creatures (what matter would it build its body from?), and an interstellar culture whose main activity is looting past civilizations seems self-contradictory.

I suggest that you look for one of his next three books.

ANADEMS

Aboriginal Science Fiction: 1988 Annual Anthology (80 pp.) is available for $4.50 from *Aboriginal Science Fiction*, P.O. Box 2449, Woburn, MA 01888. It contains some of the best stories (by Kristine Kathryn Rusch, Orson Scott Card, Frederik Pohl, Bruce Bethke, Paul Gilster, Steven Boyett, Dean Whitlock, Rory Harper, Ian Watson, Patricia Anthony, Robert Metzger, and Elaine

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Radford), and a pair of poems by David Lunde and Wendy Rathbone, from the magazine's first two years (1986 and 1987) of existence. Unlike most such anthologies, this one includes the artwork (in color, yet) that accompanied the stories in their first appearances. Also, unlike other such anthologies, it looks more like an extra issue of the magazine than a book—floppy, glossy, *Time*-sized. It may therefore fail to seem worth its price, which is rather more than that attached to an issue of the mag, which sells for $3.00 per 64-page (minimum) issue or under $2.00 per issue by subscription (same address).

Charles Sheffield's **Trader's World** (Ballantine/Del Rey, $3.95) may seem familiar to you. It should, and for precisely the reason that puts my review among my anadems, or garlands: At least two of its segments have appeared in these pages (in 1987; others may have as well, but I couldn't pinpoint them). The book tracks a boy rescued from a hidden enclave of escapees from the "Hivers," descendants of those who weathered nuclear Armageddon in underground redoubts. The boy, Mikal, seems quite primitive, as do the Hivers, and we nod wisely when Sheffield reveals that his rescuers are the more advanced Traders, who knit the world together as negotiators between various mutually hostile groups.

But then we meet those groups—the Chips, descendants of the Chinese and Japanese who fled their ruined lands for space; the Chills, electronic geniuses of Antarctica, descended from an amalgam of refugees and resident researchers; the South American Greasers, with their Carnival gone berserk; the primitive Ten Tribes of the African Darklands; the Strines, haughty Australian bioengineers; the North American Great Republic and its vast and foolish weaponry; and so on. And though we agree readily enough that Traders might be essential in a world just recovering from near destruction, and that Daddy-O, the Traders's artificially intelligent computer, might be essential to the task, we promptly begin to wonder: The Traders's world is not in such dire straits at all, for in many ways it is more technically advanced than our own, and their intelligence network is no better than those of the others. Furthermore, the Strines, Chips, Chills, Greasers, et al., move freely in their world and seem quite capable of doing their own negotiating. So what are the Traders, and their Daddy-O, really up to?

Might Sheffield be trying to tell us that trade is the lifeblood of civilization and that recognizing that simple fact offers an answer to war? Read the book to learn his answer. ■

●A thought which does not result in an action is nothing much, and an action which does not proceed from a thought is nothing at all.

Georges Bernanos

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brass tacks

Dear Dr. Schmidt and readers,

I talked a little bit with G. Harry Stine about his "Face on Mars" column (Alternate View, June, 1988) at WesterCon 41. But as many times as I've read and reread the column, I find that there are things which still greatly disturb me about it, and I hope fellow *Analog* readers will see this letter.

I am mainly disturbed by Mr. Stine's apparent attitude toward NASA and the "planetary astronomers." First of all, those of us who work in the field of planetary science go either by the term "planetary scientist" or by "planetary geologist." In general, planetary *geologists* study the landforms of planetary surfaces. "Planetary scientist" is a broader term covering astronomers who work on *our* solar system, meteorologists, and others, including geologists.

Mr. Stine is correct that the planetary science community has "failed or refused" to listen to Hoagland *et al.*'s theories on the origin of the Martian "monuments." He is also correct in pointing out that it is unfortunate that the professional scientists usually don't exchange data with the amateurs, in the tradition of Clyde Tombaugh. However, Tombaugh was an *astronomer*. Astronomers *even today* exchange data with amateur astronomers; amateurs sometimes discover new comets and asteroids. But planetary geology is much different. The difference between Tombaugh exchanging data with Walter Haas and planetary geologists exchanging data with Hoagland *et al.* is that Haas had *data* to exchange, while Hoagland *et al.* only have hypotheses (and speculations) to offer—nothing more (and in planetary geology, hypotheses are a dime-a-dozen). The *data* Hoagland *et al.* used (the *Viking* photographs) are already available to professionals and amateurs alike.

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Which brings me to another point. All *Viking* data, and indeed *all* U.S. spacecraft data, are available to the public (for a fee) from the National Space Science Data Center, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771. Mr. Stine acknowledged this in our conversation, but told me that the people there were so disorganized that they couldn't, at first, get the data to him. But his column made it sound like NASA is trying to *keep* the data from public view ("The *Viking Orbiter* photos—most of them ignored and even hidden from public view for over a decade . . . "). That's simply not true. It *is* true that most people, including a lot of planetary scientists, have not examined the entire Viking Orbiter data set, but some have. (I've seen most of them, it just takes a long time to look at *all* of them).

Mr. Stine's article also comes across as very suspicious of U.S. and Soviet plans for future Mars exploration. His tone implies that NASA is hiding something . . . that NASA intends to study the "monuments" with the *Mars Observer* (MO) Camera, but won't tell us so (yet). *Wrong*. The MO Camera isn't a "sudden appearance." Mike Malin of Arizona State University designed the camera earlier this decade; and it was presented publicly as early as 1984 in a poster (by my friend and office-mate Jeff Moore) at the Case for Mars II Conference. Originally, the MO (then the Mars Geoscience-Climatology Observer) did not call for a camera because the costs were prohibitive under the Solar System Exploration Committee's plans for "low-cost, modestly scaled, inner solar system missions" of the "Planetary Observer" class (p. 17, *Planetary Exploration Through the Year 2000: A Core Program*, Solar System Exploration Committee, U.S. Gov't. Printing Office, Washington, DC, 1983, 167 pp.) The camera was added largely for PR reasons, as well as geological interest . . . a mission to Mars *without* returning photos would simply not interest the public at all. The camera was not tacked on as an afterthought. It was approved for the flight along with the other instruments scheduled to fly. And like *all* the instruments, it has been threatened, off and on, to be pulled off of MO to save money. (Just last week [end of June '88], one instrument *really was* pulled off of MO).

As for why the MO was "strangely postponed from 1990 to 1992," anyone who reads the Planetary Society's bimonthly, *Planetary Report*, would know that there is no mystery in this delay. The Planetary Society and some members of Congress fought to keep the 1990 launch date, but NASA postponed it largely due to the backlogged launch schedules. Originally, MO could have been used to supplement the Soviet Phobos missions. But since MO has been delayed, the Soviets and Americans are considering using MO to relay data from a hoped-for Soviet mission in 1994. This is the "strange move" concerning U.S./Soviet Mars cooperation that Mr. Stine speaks of. It's not so strange. The Soviets plan, on that 1994 mission, to take pictures, and have the film rocketed back to Earth. But as a backup, they would like to relay digital data through Mars Observer. Mr. Stine does not seem optimistic that the Soviets will share this data . . . but they'll *have to*, if it is sent through MO to American tracking stations!

I also have a few additional comments, relating to Hoagland's book itself. First, I can't help but notice how similar the tone of Stine's column is to the third appendix of Hoagland's book.

I also found Hoagland's book to lack

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scientific objectivity (he even admits this!). It struck me as being more colorful and wildly speculative than even Percival Lowell's wildest book, *Mars as the Abode of Life*.

Finally, I must say that Mr. Stine is very correct in saying WE NEED TO RETURN TO MARS. But I am disturbed by the notion that we need to use the "monuments" and "face" as a way of motivating people to support new Mars missions. Can we not sell Mars to the people of this world by showing them the zillions of other fantastic and beautiful Martian landforms? I realize that if it wasn't for Lowell's canals or Burroughs's Barsoom, the *Viking* landers might not have been built to search for Martian life. It might turn out that Hoagland *et al.*'s "face" is Lowell's canals all over again. It could serve as a catalyst, among some elements of the public, but I fear that it also focuses attention on something which, like Lowell's canals, is most likely a trick of the eye. Mars is a beautiful planet, with incredible landforms. I urge everyone to read *The Surface of Mars*, by Michael H. Carr (Yale University Press, 1981, 232 pp.) I also urge you to carefully consider Hoagland *et al.*'s "monument" theories. But think critically. I welcome letters from anyone interested in learning more about Martian geology and exploration. If interested, I can send anyone a bibliography on basic reading about Mars, both scientific and popular articles, which you should be able to locate in university and science libraries (send three U.S. 25¢ stamps to cover cost).

KEN EDGETT
1714 E. 12th St., Apt. A
Tempe, Arizona 85281

(K. Edgett is a graduate student studying planetary geology at Arizona State University. Most of his work, to date, has involved examination of the photographic and thermal infrared data from the Viking Orbiters*).*

Dear Stanley,

I have long been an admirer of John Dalmas, and I feel impelled to comment on Tom Easton's review of *The General's President*. I am perplexed by some of his criticisms. He states that it has virtually no plot, no characterization, no villain except the status quo, and no hero except the author. Considering that in the course of the novel, we see the workings of a complex program to rescue the U.S. economy from nearly total collapse; an adroit maneuver to avert WW III; the uncovering and handling of a long-hidden and far-reaching conspiracy among the ultra-wealthy of the U.S.; a revolutionary and secret scientific research program which affects all of the foregoing; and several other plot threads, I think that I can safely conclude that there is a plot. Considering the fine characterization of Arne Haugen, who has a fully delineated past, diverse interests, strengths and weaknesses, strong family involvements, and even a sense of humor, all in addition to being the prime mover of the plot, as well as the plausible and diverse portraits of various other characters, I do not find characterization to be absent either. And certainly there is a villain, the evil conspirator Paul W. Massey, just as Arne Haugen is obviously the hero (nor is he merely the author in disguise). How can Tom Easton have missed all of this? It's not exactly hard to notice.

This novel is hardly, as Mr. Easton claims, a hortatory pamphlet. At 420 pages in length, it would be quite a pamphlet. Actually, it is a fully realized novel that tells a fascinating and even gripping story, while at the same time

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illuminating a number of the author's political theories. The fact that this novel has something to say, is to its credit. Too many novels have lots of fast-paced action but ultimately say nothing.

Analog itself has a long tradition of publishing material that has an explicit point or message, often very strongly made. This novel is very much in the *Analog* style, and would have seemed quite at home as an *Analog* serial. Hence I find Mr. Easton's views to be somewhat incongruous. Of course I am aware that he speaks only for himself, and is not expected to embody the *Analog* philosophy. However, in this case, I do find it a bit jarring that his opinions appear to be so much at odds with the editorial flavor of the magazine in which they appear.

DAVID PALTER
137 Howland Avenue
Toronto, Ontario M5R 3B4
Canada

Dear Stanley Schmidt,

May I combine some thoughts on your editorial on competition with your editorial on schools (A Requiem for Summer?)? I often disagree with you, but in those two editorials, you hit the nail on the head.

We who homeschool our children feel that the public schools' attempt to regulate us out of existence is on the same order as Ford telling GM how to make its cars. We believe in competition, the NEA does not. The NEA wants children in public school at younger and younger ages for longer and longer hours, no matter what the proven cost.

I vividly remember every day that I spent in public school, from the day I entered kindergarten—capable of reading but placed in a class for the retarded—to the last tedious day. If it hadn't been for my parents' encyclopedias, and microscope, and weekly treks down the mountain to an excellent library, and groaning, well-laden hikes back, I would have learned nothing in those thirteen years. College was liberation.

Now, because of the homeschool movement, I can do better by my children. The state of Texas seems to have difficulty believing that I have enough self-enlightened interest to make sure my children get a good education. Perhaps you have heard of the education reform in this state? The reform includes such things as dictating how many minutes a day must be spent on science and what page on what curriculum you must be on on what day. So what if my children consistently perform several grade levels above average on standardized tests? (Myself, I don't think much of tests, but when I say my children are tested, the critics shut up) We don't neccesarily check the boxes in correct order.

My six-year-old can't form letters too well (it will come) but he is wrestling with seventh grade math concepts and loving it. Half my lessons are given with him jiggling or standing on his head, but he knows where Madagascar and Japan are. He writes reports on our word processor. The thirteen-year-old can draw many of his lessons. Math is an agony for him (so is watching his little brother pass him up) and we can spend as long as we need on each concept until he gets it. We're doing a delight-directed study on marine biology next year (instead of our usual science curriculum) with field trips to the ocean and Sea World and growing hydra and algae. (Joy, oh joy, I get to use my microscope!) When we were all sick in January from cedar pollen allergies, we were able to slow down and even skip

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a few weeks because we got so far ahead in October. If a project just doesn't get done by May 30, we can finish it in the summer.

I go to seminars and study hard to be a good teacher. So do most of the hundreds of other homeschoolers I know. A few are strange people, even by my standards, but strangeness should not be a jailable offence. Half of my non-handicapped children are racially mixed. We live in a mixed neighborhood with children banging on our doors all the time. With church activities, club activities, and homeschool activities, our children are scarcely hermits leading cramped lives.

Public school cannot offer the individualized, careful instruction I want to give my children. I guess that's why it cannot stand the competition of homeschool. It makes them look bad.

What do you think?

LELIA ROSE FOREMAN

San Antonio, TX

Dear Mr. Schmidt:

Somewhere in or about the story "Grave Reservations" by Rowland Shew (*Analog*, July 1988) there should have been acknowledgement of the origins of the nomenclature of the "Nine Nations," which was taken almost verbatim from the book, *The Nine Nations of North America*, by Joel Garreau (©1981, published by Avon Books). The concepts and names of the divisions—e.g., Ecotopia, the Foundry—and the exception made of New York City (the point of the story!) are too similar to be coincidence, and should definitely have been credited.

ALAN P. SCOTT

Nashville, TN

The author's proxy replies. . . .

Dear Dr. Schmidt:

Mr. Shew has asked me to respond to Mr. Scott's letter. He did indeed use the book *The Nine Nations of North America*, a book he recommends highly to all *Analog* readers. Although he modified Mr. Garreau's breakdown and nomenclature slightly [e.g., The Empty Quarter was renamed The West, and Texas was made a Nation and not partitioned among three others], this was mostly for the sake of simplicity. He was reluctant to interrupt the story to explain the necessary background. However, it should have been possible to slip a reference to the book into the story, and Mr. Shew regrets not having done so.

It is only fair to mention another book, whose title was (I believe) *Commercially Speaking*. It also divided America (U.S. only) into "nations" and explained the differences in business practices, e.g., conduct of meetings, telephone use, etc. Unlike Mr. Garreau's book, it properly identified Wonderland [Los Angeles with its Las Vegas annex] as a separate nation; and divided Dixie into three sub-regions.

Of the two, Mr. Garreau's book is the better written. Mr. Shew believes it is important to contemplate the distinctions between a Nation (a cultural entity) and a State (a political entity). The two do not always correspond.

OSWALD LEMPE

for Rowland Shew, in partis incognito

Dear Dr. Schmidt:

This is a reflection by one who's only slightly younger than *Analog*. As a tyro essayist, I have found many inspirations in reading the works of Robert Anson Heinlein.

He has been lauded and vilified, published and banned, praised and damned. His ideas incorporate all the useful elements of a philosopher such as Voltaire.

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He will be quoted by me as often as I write.

He is entitled to be called a sage. He had the unique virtue of stating views which reflected a reality appropriate to people and societies. In my opinion, those views will never become outdated. Heinlein dedicated himself to a particular outlook on life—that any person has a right, responsibility and privilege of being an individual. He illustrated this theme in many ways. He expressed a joy in his life as well.

Thanks to Robert Anson Heinlein, I shall always be an Associate of Lazarus Long.

CAL SCHLESINGER

Gilroy, CA ■

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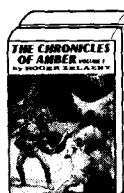

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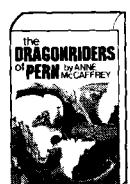

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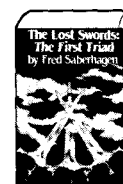

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